The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. IV. JANUARY 29, 1921 No. 85

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- abroad. Cheques, P.O.O.'s, and Postal Orders should be made payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.

Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines)

Our Empire Trade

THE present issue of THE CHEMICAL AGE—which takes the form of a Special Empire Number—is the largest we have yet published. That this journal filled a place in chemical industry not hitherto occupied by any other publication was clearly demonstrated within a few weeks of its birth, and ever since it has had the steadily increasing support of advertisers, writers, and readers. That success has been largely due to our readers themselves. They have realised that our pages are equally open to all interests; that news impartially reported and opinions expressed within the ordinary limits of courtesy and good taste are always welcome; that the paper supplies a common platform from which none who observe the rules are excluded. The result has been that all who use the journal have come to regard it as something in which they have a personal part. Already a kind of fellowship of interest—one of the most pleasant and valuable features of a newspaper—has grown up. We have attracted a group of distinguished original writers, who have written not so much for reward as for the advance of scientific and commercial knowledge, and have adopted the paper as the medium for disseminating their views. In some directions—chemical engineering, for example—we have broken new ground. For these results we are indebted to the goodwill of our readers at home and abroad. It is our hope in the future to give increased attention, concurrently with the scientific and technological sides, to the commercial aspects of chemical industry and the development of British chemical trade at home and abroad.

For the moment the problem of our export trade is perhaps the most pressing in the national interest. Only by its development can we hope to stabilize exchanges, to find outlets for increased production, and to reduce the adverse balance as between imports and exports. This is a matter too vital to be discussed from any sectional point of view. It equally concerns, as the firm of Chas. Page & Co. point out in their review of trade conditions to-day, the manufacturer, the merchant, and the consumer. Ultimately the interests of all three—abundant production, efficient distribution, and ready and economical purchase—are one, and the co-operation of all three was never more essential than to-day. The difficulties of the manufacturer hardly need to be pointed out. Not only has the cost of labour risen to unprecedented levels but the output has remained stationary, if indeed it has not receded. Local rates and cost of transport are enormously heavier, and where in spite of these difficulties profits are made they speedily disappear again in the shape of Excess Profits Duty. The merchant is in no happier position. He is encompassed about with a network of restrictions; he is exposed to the inquisition of officials, whose knowledge of trade is too often in inverse ratio to their knowledge of its practices and conditions. In such circumstances neither manufacturer nor merchant can afford to waste time and energy over domestic quarrels. In their own interest as much as in the national interest co-operation and good understanding are urgently needed. Together they may succeed in liberating trade from much of the Government control that now restricts it. With the much desired increase of production, we shall need an ever increasing constituency of purchasers abroad, and here the merchant is an indispensable factor in discovering markets and in keeping producer and consumer in constant contact. The nation has recently been appealed to by its popular Prince, just back from a tour of the Empire, to "pull together." It is as much good business as it is good patriotism. It is the simplest and most effective way of pulling chemical trade and industry safely through the difficulties it is now experiencing.

The co-operation which seems to us essential between producer and distributor at home is the only policy for the Empire at large. While politicians are trying to construct a league of nations we already have a league of nations in being within our own Empire. To

bring all these into a closer intimacy, to develop exchange of productions, to increase concurrently producing capacity and purchasing capacity—these are the fundamental objects of any sound national trade policy. In this issue we give some account, which will be read widely throughout our Colonial possessions, of what is being done in the chemical and dyestuffs industries at home to-day. This, we trust, will be some contribution to the task of making British home productions better known throughout the Empire, and of enlarging our markets and our commerce.

Electrical Precipitation

In our issue of January 15 we drew attention to the electro-deposition of particles in blast furnace gas and the recovery thereby of potassium compounds. In briefly reviewing the work which had been done both in America and latterly in this country, we referred to the experiments conducted by Professor White and others in connection with the more aggravated problem of precipitating minute liquid particles or vesicles.

A correspondent who is interested in the subject has since written asking us to give fuller information of liquid deposition, for he states that he has been able to find little literature dealing with it. It will be appreciated, of course, that liquid precipitation is never likely to become so important as the deposition of solid matter, but there can be no question that, once perfected, it will play an extremely helpful part in the cleansing of many industrial gases. It was in 1914 that Professor White attacked the problem of electrically precipitating tar particles. While he succeeded in de-tarring approximately half-a-million cubic feet of gas per day, he did not solve the problem of preventing contamination of his insulators. Thus the process was not capable of operating continuously. As a pioneer, however, Professor White must be looked upon as having demonstrated the possibilities of the process, and his work was subsequently developed by Mr. Steer, who had originally assisted him. Steer turned to account the well-known fact that a discharge of electricity into a gas volume will ionise it, and that ionisation promotes agglomeration of the minute fog particles into larger drops which are far more easily dealt with. The Steer process, however, is scarcely the same as electrical deposition, and while it may effect agglomeration it does not necessarily effect total removal.

The latest and most important work has been carried out by Dr. J. G. Davidson (*vide* Report No. 3, Canadian Council for Scientific and Industrial Research) who conducted successful tests for the cleaning of gas on a commercial scale in connection with wood, coal, and petroleum distillation plants. Davidson came to the conclusion that electrical precipitation can be used for the collection of tar produced by the low-temperature distillation of coal without the necessity for opening up the treater for cleaning the insulators, even though the treater is not constructed so that the insulators are protected from the formation of films on their surfaces. On the other hand, cleaning of the insulators has to be resorted to when gas from high-temperature distillation is dealt with. In general, difficulties of insulation increase with the temperature of distillation and with the amount of free carbon in the deposit collected.

What is a Capitalist?

There are many who claim that the only practical sedative for industrial strife is the introduction of some arrangement whereby the workman is entitled to share in the prosperity of his employer. In the "Times" recently an attempt has been made by a number of correspondents to define a "Capitalist," and in the views of one well-known political figure the capitalist is one who employs labour for the purpose of earning a profit out of it for himself. As a matter of fact, there is nothing very inaccurate about this interpretation, for no undertaking can presume to carry on with borrowed money unless it can meet its obligations in the way of interest, and it is not, therefore, the workman only who is turned to profit, but all officials from the directorate downwards. In other words, the whole community is employed for profit to its own advantage, for in the process of earning money for others it is providing itself with its own means of livelihood. The uneducated are apt to jump to the conclusion that a principle which exacts service from an individual and rewards him with something less than the actual monetary value of that service can only be described as exploitation. If the question is analysed, however, it will be appreciated that the gross value of a man's labour, whether it be with brain or hand, is, say, £*x* per day. Of this total sum the labourer receives a proportion as remuneration, while the remainder is allocated to a common fund out of which interest on capital, or "profits" as they are called, is met. So long as the profits are not excessive and the wage earner receives the greater proportion of his gross value no objections can be raised from an ethical standpoint; but a different aspect arises when the profits assume large proportions in relation to the original capital outlay. In such cases, the worker may have grounds for feeling aggrieved, and will instantly jump to the conclusion that his monetary value as compared with his trade value is being underestimated.

It cannot be said that there is any universal panacea for situations of the kind, but the nearest approach to a solution must undoubtedly be the general introduction of some system whereby the employee participates in profits on a *pro rata* basis. There are many undertakings who seek to-day the advantages attending a profit sharing scheme of the kind—and, if we accept as accurate the "Times" definition of a capitalist quoted above, then profit sharing, universally applied, would put every employed unit into the category of a capitalist.

Soda Crystals

During the past week there has been another series of prosecutions of dealers in soda crystals who have charged purchasers what are held to be unreasonable prices. Soda has long been recognised as a valuable domestic commodity, and any steps that tend to keep its price within reasonable limits will no doubt be welcomed by the public. The amount, however, spent on it in each household cannot be large, and we fancy the majority of families suffer more heavily

from the increased prices of other commodities in themselves more expensive and used in considerably larger quantities. A fresh egg, for example, which the farmer who keeps poultry may get 3d. for, may be served up, after being briefly steeped in boiling water, at 8d. Houses again, of which many families are urgently in need, have been changing hands within a short period at double the price they were purchased for. Still more notable is the practice of speculators in buying up large old houses, converting them into flats, and letting these out at surprisingly high rents. It is, of course, very difficult for the authorities to control all these matters so as to ensure a minimum rate of profit on all commodities, but there would seem to be only two logical lines of policy—either to control the price of all essential commodities or to let them all be determined by ordinary trade conditions. After recent experiences of Government control of trade we do not think the public would much care for the former. As regards the chemical industry we believe that merchants generally have no sympathy with exorbitant profits, which in the long run do more harm to the industry than good. The difficulty is, however, to know exactly what a safe profit is in the absence of a fixed standard, and on account of this uncertainty many firms, we believe, are declining all transactions in soda crystals.

Restricted Import of Germans

IT is amusing to learn that while the dyestuff interests of the United States are actively agitating for a measure to prohibit the import of German dyestuffs, the leading American dyestuffs concern is actually importing German chemists. Two of these gentlemen, described as dye experts engaged by the Du Pont Company at salaries exceeding $25,000 each, were recently held up at Ellis Island by the U.S. Immigration Commissioner on the arrival of their steamer. Major Sylvester, head of the Du Pont police, appeared before the Board of Inquiry for the company, to confirm the statements of the German passengers. Their admission into the United States was opposed by the German authorities, and they were examined by the Vice-Consul-General of the Netherlands Government at New York, who represents the German Government. The chemists who denied that they were carrying any written formulæ for the manufacture of dyestuffs, gave the names of Dr. Otto Ranger and Dr. Joseph Flachslander, and said they were graduates of the University of Munich. Both had regular German passports, vised by American Consuls overseas, and the special permit of the American State Department. We have not heard of any similar invasion of this country so far, but if the Board of Trade should be compelled to import one or two exports from the Rhineland to complete its Advisory Committee an interesting position would arise.

New Process for Acids

WE are informed that a young British chemist has recently perfected an entirely new process for the production of dye intermediates. This process, we are assured, is particularly useful for the making of the very important H and Gamma acids by the fact that the time of manufacture is considerably shortened and the cost of production very much lowered. It is claimed that by the use of this process H acid can be sold at 8s. per pound, this being a little more than half the present market quotation. It is also claimed that Gamma acid can be made and sold at about two-thirds of the present market value. Two small companies, we understand, are in the course of formation to produce these acids, and we shall be glad to put any manufacturing or distributing firms interested in communication with them, so that the claims of the new process may be independently investigated.

The Calendar

Feb. 1	Hull Chemical and Engineering Society: "Notes on Chemical Engineering," by A. R. Warnes. 7.30 p.m.	West Street, Hull.
1	Chemical Association: "The Applications of Electrolysis to Chemical Industry," by J. M. Veale. 4.30 p.m.	Royal College of Science, Dublin.
2	Royal Society of Arts: Ordinary meeting. "Oil Burning Methods in Various Parts of the World," by A. F. Baillie. Professor Sir John Cadman will preside.	John Street, Adelphi, London.
2	Society of Chemical Industry (Newcastle-on-Tyne Section): "Colloids," by Emil Hatschek; "Lubrication and Lubricants," by L. Archbutt. 7.30 p.m.	Armstrong College, Newcastle.
3	Society of Public Analysts: "The Dyeing of Paper," by Julius Huebner.	Yorkshire.
3	Royal Society: Papers by G. B. Jeffery; M. N. Saha; F. W. Darke, J. W. McBain, and C. S. Salmon; J. Mercer.	Burlington House, Piccadilly, London.
3	Society of Dyers and Colourists (West Riding Section): "The Dyeing of Paper," by Julius Huebner.	Yorkshire.
3	Chemical Society: Informal meeting. 8 p.m.	Burlington House, Piccadilly, London.
4	Chemical Society: "Power Alcohol," by E. Sinkinson.	Royal College of Science, Sth. Kensington, London.

Books Received

THE CHEMICAL, DYE AND COLOUR MANUFACTURERS AND MERCHANTS DIARY. 1921 Edition. Pp. 201. 15s. net.

A TEXT-BOOK OF INORGANIC CHEMISTRY. By J. R. Partington. (London: Macmillan & Co., Ltd., pp. 1062. 25s. net.

INORGANIC CHEMISTRY. By E. I. Lewis. (London: Cambridge University Press.) Pp. 443. 9s. net.

INDUSTRIAL CHEMISTRY. By R. S. Morell and A. de Waele. Edited by S. Rideal. London: Bailliere, Tindall & Cox. Pp. 236. 12s. 6d. net.

INTRODUCTION TO QUALITIVE CHEMICAL ANALYSIS. By T. W. Freseniers, London: J. & A. Churchill, pp. 954. 36s. net.

EXACT DATA ON THE PERFORMANCE OF STEAM BOILER PLANTS. By David Brownlie. (London: Brownlie & Green, Ltd.) Pp. 14. 2s.

MEMOIRS OF THE COLLEGE OF SCIENCE. Kyoto Imperial University. Vol. III., No. 2; Vol. IV., Nos. 1 to 6.

Electrostatic Precipitation Applied to Blast Furnace Gases

By Dr. H. J. Bush

In view of the interest taken in this subject we give below an account of the Electrostatic Precipitation process as applied to blast furnace gases, with some notes on what has been done in this country by Huntington, Heberlein & Co., Ltd.

THE problem of cleaning dust laden gases by subjecting them to the action of electrostatic forces constitutes one of the most fascinating problems presented of recent years to the industrial investigator.

On the face of it the explanation of what happens appears simple; we have a point discharge electrode suitably insulated and connected to a source of high-potential opposed to a plate receiving electrode maintained at zero potential. The "point" electrode may be a thin wire or a sharp edge, and the "receiving" electrode may be a plate or a pipe, in which the discharge electrode is axially suspended. The dust particles approaching the highly charged point electrode take up the same charge, and are repelled from it towards the plate electrode which is earthed.

A Wide Field for Exploration

This is, however, a very incomplete description of the phenomena in question, and the further we penetrate into the field of electrostatic precipitation the more we find how limited our knowledge is of the laws governing it, and how much still remains to be explored and charted in spite of the immense strides made.

The band of young enthusiasts in Southern California, mostly students of F. G. Cottrell, while the latter was at Berkley University, have progressed far indeed since they first attempted in collaboration with him to translate his small scale experiments into a technical process, a process which now takes its place as a standard means of separating suspended dust from waste gases, an ever present problem in so many metallurgical operations.

There are now some 150 Cottrell installations in operation in various parts of the world, the results of which are carefully sifted and correlated by a mixed staff of electrical engineers, physicists and chemists. The erstwhile largely empirical methods are giving place to procedure based on certain natural laws which appear to govern the phenomena in question.

The endeavours to apply electrical precipitation to the cleaning of blast furnace gases has once again amply vindicated the old adage which exhorts us to regard the appearance of the first swallow without undue elation. Short-lived triumphs were followed by disappointing stretches of apparently complete failure, just sufficiently relieved by sporadic flashes of success to keep the convuction alive that the road was the right one, though the precise nature of the obstacles barring the way might not be clearly recognised.

History of the Investigation

In England, Huntington, Heberlein and Company, as representatives of the Cottrell system, and independently the Lodge Fume Deposit Company, attacked the problem, while simultaneously in America and on the Continent it was receiving the close attention of keen investigators. A great deal of useful and highly interesting material has thus been collected, critical examination of which shows that generally speaking the conclusions arrived at by the different operators correspond very closely while the means adopted to secure success are nearly identical throughout. The few exceptions which do not fall into line at present will no doubt find their explanation in due course; in fact, at any moment the peculiar factors to which they most probably owe their existence may cease to operate either temporarily or permanently, and thus restore the uniformity of the picture.

An Early Installation

The Cottrell system of electrostatic precipitation was tried out on blast furnace gases for the first time in this country at the works of the Workington Iron & Steel Company, who produce basic pig iron from West Coast and Spanish ores. The first experimental plant was a brick chamber with electrodes suspended vertically therein parallel to the direction of flow of the gases. The discharge electrodes connected to the source of uni-directional high potential were carried by special quartz insulators, and the receiving electrodes were earthed by connecting them to the steel structure. The calculated capacity was 17,000 cubic ft. of blast furnace gas per minute. The electrical generating set consisted of a direct-current motor driven off the works supply, and directly coupled to a 5 kw. alternator with exciter and field resistance to provide the necessary voltage regulation for the primary of the Cottrell step-up transformer. These machines as well as the necessary resistances and switchboard, were of British make. The mechanical rectifier for converting the alternating current delivered by the alternator to intermittent direct current was one of a number purchased from the Ministry of Munitions and of the same type as that installed at the Queen's Ferry Cottrell plant. A considerably modified design is now manufactured in this country, and is giving excellent results.

The working voltage of the installation calculated from the primary potential by transformer ratio was 65,000. The temperature of the gas at the point where the branch pipe leads off to the Cottrell precipitator was on an average 250°C., and every endeavour was made to retain this so-called sensible heat of the gas. It soon became apparent that conditions in the precipitator were not as they should be, and every known means of rectifying them was tried without avail. Finally, it was decided to make a radical change in the design of the precipitator, and an entirely different type was substituted, built along the lines of an experimental plant, with which promising results had been obtained at an American steel works. The capacity of the new plant was 240,000 cubic ft. of gas per hour. Vertical pipes 12 in. in diameter formed the collectors, and wires suspended in the centre formed the discharge electrodes. The wires were attached in the usual way to a 'bus-bar frame, supported on insulators, and the pipes, including the steel framework, were securely connected to an earth plate, and thus maintained at zero potential. Every effort was made to incorporate in this plant the results of the most up-to-date experience available in the field of electrostatic precipitation, and it was thought that in regard to design nothing had been left undone that could help to make the plant a success.

Early Failures

The installation was carefully attuned and adjusted, and the gas admitted. Disillusionment was not long in coming. In a short while it became apparent that the only result achieved by altering the design was to reproduce the precise conditions previously established, no amount of coaxing would induce the elusive fume particles to arrest their flight through the pipes, and settle down in a sober fashion under the persuasive pressure of some 60,000 volts. Drastic treatment with water, steam and even sulphuric acid made no impression, and it was feared that Nature was not going to yield the secret of bringing the obstreperous particles to heel, when a chance observation presented a clue, which intelligently followed up supplied the solution of the problem. As soon as the conclusion arrived at had been thoroughly put to the test designs, were prepareda for an installation to handle the gases from three blast furnaces.

An electro-precipitator now in course of erection comprises six compartments of 64 pipes each, so arranged that any one can be isolated for purposes of inspection or repair. Provision has been made for adding an additional four compartments in case an extension should be found desirable at a later date. The dirty gas main is placed along the centre line of the construction at a height of 44 ft. from the floor level, and the clean gas main in corresponding position at a lower level. Each set of 64 pipes is connected to a 25 k.v.a. generating set, situated in an adjacent building. It is, however, anticipated that one such electrical unit will be sufficient to handle two sets of pipes. A series of hammers arranged on a rocking shaft, and operated by a single motor, are provided as a means of dislodging the dust adhering to the inside of the pipes, a secondary gear agitating the discharge electrodes suspended from insulated 'bus-bar supports. The rapping gear has been designed with a view to eliminating the human factor to the greatest possible extent from the operation of cleaning the electrodes. The operator simply moves a belt from the loose to the fast pulley, whereupon the hammers are set in motion and simultaneously the discharge

electrodes are jerked. The dust collects in steel hoppers fitted with luted valves. Each valve discharges into a box fitted to the bottom of the hopper, which will hold the dust from a six hours' run and has a balanced outlet flap. This arrangement enables the operator to empty the dust into railway trucks independently of whether the compartment in question is working or not.

Electrical Arrangements

Six electrical generating sets are installed in this plant, each consisting of motor-generator, mechanical potential rectifier, transformer and necessary insulators. Each set has a simple form of hook switch in the high tension line. This is operated by means of an insulated pole and forms a convenient means of making and breaking the high-tension circuit without having to stop the generators. Provision has been made to enable the operator at a moment's notice to connect any one generating set to any of the six precipitator compartments. To guard against the danger of explosion, through air entering the precipitator in the event of the gas pressure in the main dropping below zero, an automatic tripping gear will be installed which is operated by the gas pressure. It consists of a pressure gauge and a secondary circuit, which is closed when the gauge registers a minimum, and, being connected with the no-volt release coils of the circuit-breakers, causes the latter to drop out on all the six sets. The plant should be in operation within the next six months.

Progress in Germany

In Germany experimental work in the same field has been conducted at the Duisburger Kupfer Hutte, and latterly at Gelsenkirchen. The apparatus at the first-named place was a plate and wire type precipitator, and gave some trouble, necessitating radical alterations. At Gelsenkirchen a pipe and wire precipitator was put in of such dimensions that continuous tests could easily be carried out, and all necessary observations taken without interfering with the regular work of the blast furnace. Very extensive tests were made, and many curious observations, which throw additional light on the factors influencing electrical precipitation. It was established beyond a doubt, for instance, that the condition of the furnaces has an appreciable influence on the subsequent precipitation of the dust and this point must be duly taken into consideration in designing an installation, so that its efficiency may not be impaired by the fluctuations normally to be expected in a blast furnace. A discussion of the theories put forward in explanation of the above is outside the scope of this paper, and must be reserved for a future occasion.

Application to Gas Engines

It is said that in Germany the management stipulate an efficiency of 99·9 per cent. for gas cleaning plants, in order that the gas may be used without further treatment in engines. Undoubtedly the use of blast furnace gas for internal combustion engines is more common in Germany than with us, which may account for the stringent demands made on cleaning plants. It is a debatable point, however, whether in English practice a 99·9 per cent. standard of purity is either necessary or economically justifiable. In view of the fact that the proportion required for the stoves and boilers is at least 80 per cent. of the total it is surely wasteful to reduce the dust contents of the gas below that figure. The gas supplied to internal combustion engines has to be cooled, and the reasonable policy to pursue would therefore seem to be to first take out, say, 95 per cent. of the dust from the total available gas, and subsequently to condition only such a proportion of it as is needed to supply the engines by cooling and a second treatment in an auxiliary electrostatic precipitator or by washing in a wet washer.

On the other hand, one must guard against going too far in the other direction, and being content with an efficiency of 80 per cent. or even less.

The constituents of blast furnace gas most difficult to recover are the chlorides of the alkaline earths. Now, not only is it precisely these which are most active in deteriorating of the firebrick linings of the stoves and furnaces if allowed to remain in the gas, but, in addition, failure to recover them deprives the management of a source of revenue, which, modesst though it may be, in many cases cannot be entirely disregarded.

Recent Installations

We give below a summary of the installations Huntington, Heberlein & Co. have supplied and erected for electrical precipitation in this country :—

1917 : H.M. Factory, Queensferry.—Recovery of sulphuric acid from waste gases of 16 Gaillard concentrating towers. Erected in acid-resisting masonry with lead electrodes, five electrical generating sets of 10 k.v.a. capacity each. Gas volume=rated at 64,000 c. ft. per min. Recovered=average of 25 tons per day of sulphuric acid containing 50 per cent. H_2SO_4.

1918 : H.M. Factory, Oldbury.—Same as above with various slight improvements. Completed when armistice was signed.

1918-19 : Royal Naval Cordite Factory, Holton Heath.—Recovery of sulphuric acid from waste gases of four Kessler concentrating furnaces, object=to avoid contamination of gun-cotton in storage by acid fumes. Erected in timber, lead-lined with lead electrodes, two electrical generating sets of 10 k.v.a. each. Gas volume=fluctuated in wide limits. Recovered=dilute acid containing 33 per cent. H_2SO_4.

1917-18 : Thames Metal Co., Northfleet.—Recovery of oxides of zinc tin and arsenic from metallurgical furnaces. Erected in steelwork and concrete. Four electrical generating sets of 10 k.v.a. each.

1920 : Royal Mint Refinery (Rothschild & Sons).—Recovery of precious metals from crucible refining furnaces. Steelwork, 12-in. pipe and wire electrodes.

1920-21 : Royal Mint Refinery (Rothschild & Sons).—Recovery of sulphuric acid from waste gases. Same construction as for R.N. Cordite Factory. Not yet in operation.

1919 : Unione Italiana Concimi, Milan.—Removal of dust from gases of mechanical roasting furnaces. Constructed in brickwork, with M.S. electrodes.

1919 : Workington Iron & Steel Co.—Removal of dust from blast furnace gases. 36 M.S. pipes and wire electrodes. Electrical generating set=one 10 k.v.a.

1920-21 : Workington Iron & Steel Co.—Removal of dust from blast furnace gases. 384 M.S. pipes and wire electrodes. Six electrical generating sets 10 k.v.a. each. Estimated gas volume=4 million an hour.

Quality of Water for Dyeing

The Problem of Varying Alkalinity

BEFORE the Batley Textile Society, on Monday, Mr. E. V. Chambers, of Messrs. Chambers & Hammond, chemical engineers, Lightcliffe, lectured on "Efficiency of the Non-Textile Section of Manufacturing." Mr. Chambers dealt with many aspects of his subject, but paid particular attention to the question of water quality in scouring and dyeing. For these uses, he said, the water should be soft, colourless, neither acid nor alkaline, without suspended solids plentiful and cheap. A water meeting all these requirements, unfortunately seldom met with, and the present location of the textile industries was due to the fact that in the past there were unlimited supplies of suitable water. The industry, however, had developed, whilst rainfall had not increased and, unless great care were exercised, there was a danger that the question of water supply would become critical.

In many factories schemes had been formulated for reducing water consumption and in other cases work was being conducted for the purification of trade waste waters for re-use for manufacturing purposes. Owing to increasing population, water-catchment areas were becoming limited and supplies were being obtained partly from waterways, streams, boreholes and wells. In their natural state few of such waters were quite suitable for manufacturing purposes, but could be made useable by treatment. The treatment must depend on the chemical and physical properties of the water. Variation in alkalinity in water had been the cause of many troubles in dyeing processes, especially in wool dyeing. If the variation of alkalinity of river water were overcome and the suspended solids were removed, such water should require little further treatment for the dyehouse, and would be much less costly than the ordinary corporation supply.

Mr. Chambers proceeded to deal with questions of effluent purification, treatment of waste, selection, purchase and application of raw materials, foreign competition, and efficiency generally in production.

Reviews

PUBLIC HEALTH CHEMICAL ANALYSES. By Robert C. Frederick and Aquila Forster, Ph.D., M.A., A.I.C. Constable & Co., Ltd., London, 1920. Pp. 305. 10s. 6d.

A book without a preface, consisting of 294 pages of notes, divided into sections dealing with the usual routine work of a public health laboratory. The first three sections are headed Gravimetric Analyses, Volumetric Analyses and Colorimetric Analyses; then follow sections on air, water, sewage, milk, various foods, wines and spirits, beverages, condiments, detection of metallic poisons in foodstuffs, disinfectants, soap and rag flock. An appendix of weights and measures and an index concludes the volume. The section on air is largely devoted to a description of Haldane's apparatus for the estimation of carbon dioxide, which apparatus Mr. Frederick seems to have had special opportunities of using, and this section is mainly a reprint of this author's paper in the *Journal* of the Society of Chemical Industry in January, 1916. The book contains the usual illustrations.

S. R.

THE ANALYST'S LABORATORY COMPANION. By Alfred E. Johnson, B.Sc., F.I.C., A.R.C.Sc. Fifth Edition, thoroughly revised, with additions. London: J. & A. Churchill. 1920. Pp. 176. 10s. 6d. net.

In this new edition of Johnson's well-known book of tables and chemical notes, several additions have been made and part of the matter previously published has been revised and considerably altered. In the beer-analysis section the official table incorporated in the Finance Act of 1914 for determining the original gravity of beer has been introduced in place of the tables by Graham, Hofmann and Redwood that have been in use since 1880. And Mr. Johnson has added a table of his own compilation in which degrees of original gravity corresponding to spirit indications 0·01 to 0·09 are shown. In the section devoted to butter, margarine, milk and cream several legal enactments appear, and in the section dealing with oils, fats and waxes a table is given which shows refractive indices corresponding to scale readings of the butyro-refractometer. In the sugar section Ling and Rendle's volumetric method for determining the amount of sugars in solutions has been introduced, and several tables relating to sugar analysis have been added.

Some of the tables in the book would be much more useful if they were considerably extended. On page 78 appears a short table giving the strength of saturated solutions of a few common salts. A more complete table of saturated solutions of common salts would be very useful, but the table shown is too meagre to be of much service. It does not enable us to compare, for example, the solubility of potassium hydrate with that of sodium hydrate, or the solubility of normal potassium carbonate with that of sodium carbonate, yet these comparative figures are often required by chemists. On page 7 is a table giving the densities of gases. This table would also be more useful if it were extended and if a column giving the weights per cubic foot at 60°F. were added.

H. F. H.

A TEXT BOOK OF CHEMICAL ENGINEERING. Edward Hart, Ph.D. The Chemical Publishing Co., Easton, Pa., 1920. (London: Williams & Norgate, 14, Henrietta Street, W.C.) Pp. 211+xii.

We can heartily recommend this book to students about to take a course in chemical engineering, and it also constitutes a useful compendium of American practice. The author is the inventor of useful plant and apparatus such as the Hart condenser, and in his capacity of Professor of Chemical Engineering at Lafayette College, can speak with authority from the educational point of view. Taken as a text book for students, the treatment is admirable. Minor errors and omissions are of small moment, as it is the teacher's job to elaborate the subject and to build on the foundation provided. The diagrams and illustrations are sufficiently clear and plentiful to save valuable time during the course of instruction, but there seems no valid reason for wasting four pages of the introduction on a non-alphabetical list of them. The introduction is short and eminently to the point; in fact, it would be difficult to give better advice to the budding chemical engineer.

The book is divided into fourteen chapters, dealing with Materials, Location of Works, Boilers, Prime Movers (why always drag these in ?), Plumbing, and then the various main operations in Chemical Engineering, such as Drying, Crystallisation, Evaporation, &c., are described, with suitable references to standard books on the subject. The chapter on Tanks is a particularly useful feature, while Filtration is very comprehensively treated, although no reference is made to centrifugal filters and separators of the Gee and Sturgeon type. Evaporators of the Kestner type, and the use of compressed air for "blow-cases," as they are called in America, should also have been included. There is a curious error on page 136, Filter-cel, a filter medium, being described as a material similar to the Filtros plate; in a footnote, the author adversely and apparently gratuitously criticises Hatschek's recent paper (J.S.C.I., XXXIX., 2,267), without, however, giving chapter and verse. Under absorption of gases, no mention is made of tower packings, while on page 143 it is stated that reinforced cement tanks may be used as containers for nitric and sulphuric acids. This hardly seems sound practice; except for weak acids, and then only if hot paraffin wax has been well "ironed" or melted into the cement under a blow lamp.

The book is not free from typographical errors, and these, as well as the imperfections of omission and commission in respect of which the author asks for indulgence in the preface, will no doubt be remedied in the next and, let us hope, amplified edition, which is sure to be called for at a very early date.

C. J. GOODWIN.

TEXT-BOOK OF ORGANIC CHEMISTRY. By A. F. Holleman. Edited by A. Jamieson Walker and O. E. Mott. (New York, John Wiley & Sons. London, Chapman & Hall, Ltd., 1920. Pp. 642. 18s. 6d.)

The popularity of Professor Holleman's text-book among English students of organic chemistry is evident from the fact that it has reached its fifth English edition, and of the remaining seven languages into which it has been translated, the number of editions has only been surpassed by that in German which has attained fifteen.

In a treatise of these dimensions its scope must be carefully restrained, and Professor Holleman has done wisely in selecting from a vast number of compounds a few of typical substances which will serve to illustrate the characteristics of a group. One is not quite so certain that he has been equally well advised in interspersing throughout the pages short and often inadequate references to certain physical phenomena, which are usually treated in a more systematic and comprehensive fashion in text-books of physical chemistry. As an introduction to stereochemistry, the polarimeter is figured but very inadequately explained, whilst under refractivity the student is referred to a book on physics for the apparatus and its use. Electrolytic dissociation, absorption spectra, viscosity, abnormal vapour density, emulsification, &c., are treated in the same superficial manner.

The book is essentially theoretical in character, new processes and the adaptation of old ones to modern methods being subordinated to matters of theoretical interest. For example, descriptions of the manufacture of butyl alcohol and acetone from starch, of formic acid from carbon monoxide and sodium hydroxide solution, of cordite and similar explosives from nitroglycerine and gun cotton, of sodium cyanide from ammonia, sodium hydroxide and carbon, and reference to important drugs such as cacodylic acid, butyl chloral, &c., are omitted.

We would suggest that the obsolete glass funnel and cone figured on p. 30 might be replaced with advantage by a modern Buchner funnel, and the Thiele melting-point apparatus by one more easily accessible to the student, that the term "dextrose" be substituted by "glucose" in accordance with recent nomenclature, and that the new formulæ for the disaccharoses find a place. On the bottom of p. 155 it is stated that "tervalent carbon atoms do not exist," yet, in apparent contradiction, "triphenylmethyl" is described possessing this very structure. We do not attach any serious importance to the criticisms which we have been led to make. It is difficult to strike a just balance between that which is theoretically essential as a foundation, and those facts which are practically important as a superstructure. The success which this text-book has attained is perhaps the best test of its general excellence, to which we frankly subscribe.

Development of Empire Trade

What British Chemical Firms are Doing for its Development

This issue of "The Chemical Age" deals specially with the development of trade throughout the British Empire, and will be widely circulated Overseas in order that our Colonial readers may learn something of the activities of British manufacturers in all branches of chemical industry. The subject is dealt with below in the following order:—

1. *Review of British Chemical Trade, by Chas. Page & Co.*
2. *Key Industries Bill and Fine Chemical Industry, by Dr. Isherwood.*
3. *British Dyestuffs Industry.*
4. *British Chemical Industry.*
5. *British Chemical Engineering Developments.*

Position of the Chemical Trade

By Chas. Page & Co.

MANY years ago Lord Beaconsfield, in speaking of the state of trade in England, made the remark that chemicals were an index to the conditions of trade throughout the country. Some of us will remember that at the time this remark caused much discussion, but it was as true as it was shrewd.

Chemicals, in one form or another, enter into almost every process of manufacture, and in consequence a very large proportion of people in this country are, or should be, interested in the prosperity of the chemical trade.

Manufacturer, Consumer and Merchant

At the present time this trade as a whole (comprising producers, consumers and merchants) is passing through a period of difficulty which may fairly be described as a crisis in its history. At the moment, in which the trade is, so to speak, renewing its youth, when processes in this country are resuscitating after the lapse of years, it finds itself obliged to cope with great difficulties in regard to labour, and with competition from other countries, such as was not expected until a much longer time after the war. These are largely the difficulties of the manufacturer.

The consumer is in no better case. The thousand and one processes into which chemicals enter are reduced in volume owing to the slackness of trade, due to the high cost of production and the reduced purchasing power of potential buyers.

The merchant is even worse off. Not only does he suffer in his pocket, as the conditions of trade affect him equally with the manufacturer and the consumer, but he suffers in his self-esteem. The merchant has been told many times of late years that he is useless; even that he is a parasite. This idea appears to have originated in Government offices, where men with theories but with little knowledge of the ramifications of trade, found that at a time when production was at a low ebb and the demand for goods was much in excess of the supply, it was quite simple for the buyer, chiefly the Government, to have direct dealings with the manufacturer. This idea was taken up and endorsed by certain producers, whose output was great enough to maintain a large selling department; who, in fact, were merchants as well as manufacturers.

The men of theory and little practice in the Government departments still nurse their fad, but we hear less of it from the manufacturer who begins to feel the difficulties of direct trade in face of renewed competition. To-day the question of credit and honest dealing in regard to the fulfilment of contracts require the maximum of expert knowledge and experience which the established merchant can supply.

A Hopeful Note

Undoubtedly then the chemical trade is at present faced with many difficulties, but we may feel sure that this is only a temporary phase. This country has faced much greater difficulties, but the common-sense desire of her people for the good of the country as a whole has brought about a combination of forces which have enabled her to surmount these difficulties, and it is our conviction that this will repeat itself in regard to the chemical trade.

In conclusion, we would emphasise that the present difficulties, considerable though they may be, are not insurmountable, and we look forward to a period of renewed prosperity and employment for the British chemical industry.

The established merchant, as a class, is only too willing and anxious to support the British manufacturer, providing he is given sufficient facilities, and with his extensive knowledge of the conditions governing the various export markets he should be able to provide a ready market for the many products produced in this country. If this end is to be attained, however, it is essential that the merchant should receive the full support of the manufacturer, and thus support, we believe, is being much more readily extended to-day, now that the difficulties of export business are becoming more apparent to the manufacturer, especially those who have recently entered the export field on their own account.

Key Industries Bill and the British Fine Chemical Industry

By P. C. C. Isherwood, Ph.D., F.I.C.

Chairman of the Fine Chemical Group of the Association of British Chemical Manufacturers.

ALL the arguments wgich led to the passing of the Dyestuffs Import Restrictions Bill apply with even greater force to the same protection being extended to the fine chemical industry. Both are infant industries called into being when war suddenly cut off the nation's erstwhile supplies, but whereas the want of particular shades of colour could not possibly make all the difference between defeat and victory, failure of supply of synthetic drugs, anæsthetics, antiseptics and other fine chemicals was a matter of vital importance. Fortunately in August 1914 there was already established a nucleus around which the present industry grew, but few people with the exception of those who are in a position to know, realise the amount of work, money and ingenuity which has been expended in bringing the industry into the position which it holds to-day.

The Government has repeated stated, both in and out of Parliament, that come what may, the country would never be allowed to drift into the dangerous and humiliating position it undoubtedly was at the outbreak of war. It was on these promises that individuals and firms undertook costly experiments and research, and sunk vast sums of money in buildings and plant.

The Position To-day

What is the position to-day? Germany, with a fine chemical industry, highly organised before the war and immensely increased during the war, is making use of her strong position to strangle our infant industry by methods which no one knows better than herself how to use.

Aided by the exchange positionsshe is setting out deliberately to make the production of fine chemicals in Great Britain impossible. She realises that now is the time to act and acting she is. Prices of fine chemicals far below costs of production here, even when theoretical yields are assumed and current market prices of raw materials taken into account, are being freely circulated on this market. The effect of this is already seen in works closed down on every hand, with consequent unemployment of skilled men. All development is stopped and unless something is done without further equivocation or delay, the fate of the British industry is sealed, and we shall return to the position of dealers and jobbers in German products, as we mainly were before the war. Let us see what this means, and what we should sacrifice for the very problematic and purely temporary advantage of artificially low prices. First, in the event of war, we should have to go over the same weary and ruinously expensive ground again, because without fine chemicals, war cannot be successfully carried on. The next war, despite all that has been said to the contrary, will probably be largely carried on by the use of toxic gases and for both offence and defence, especially the latter, fine chemicals are essentials

Secondly, skilled chemists, whom it takes years to train, cannot find employment. The fine chemical industry requires more trained chemists than any other branch of chemical activity.

Thirdly, it is universally admitted that aviation will be a still more important factor in future wars than in the last, but without it well established factories for the manufacture of the fine chemical constituents of aeroplane dope, no rapid construction of aeroplanes is possible.

The call to all people who have the welfare of the country at heart is urgent. The Government must be called upon in no uncertain manner to redeem its solemn promise given in times of dire need. Two precious years since the Armistice have been frittered away. Prompt action is necessary or it will be too late.

British Dyestuffs Industry

L. B. Holliday & Co.

It is sometimes overlooked that there are in this country a few firms manufacturing dyestuffs which have received no Government assistance in the way of capital or subsidy or research grants. Of these, probably the most important in point of range and quantity of output is L. B. Holliday & Co., Ltd., which pursues an entirely independent course, relying upon the characteristically British methods of individual enterprise, personal direction and hard work both in research and production.

The firm commenced operations in 1915, having 60 bare acres of land, but no plant, no staff, no process in work, and no business connection established. Within five years it had achieved an output of between 250 and 300 tons per month, comprising more than 100 chemically different dyestuffs, and affording employment for 1,000 workpeople.

This long list of dyestuffs comprises in the first place a very complete range of basic colours, which include methylene blue, auramine, magenta, safranine, chrysoidine, bismarck brown, methyl violet, brilliant heliotrope, new blue, indoine blue, malachite green and others—all of unquestionable quality. In every other class of dyestuffs the range has steadily extended and is still extending; it includes sulphur dyes, acid dyes, substantive dyes, hydranthrene or vat dyes for cotton, acid alizarine dyes, and monochrome fast dyes for wool.

During the last few months the substantive dyes and acid dyes have received great attention and corresponding development. The new cotton colours comprise chrysophenine G, paramine brown M, paramine fast violet N, paramine fast red F, paramine green G, and of new acid colours there are orange IV., Indian yellow, fast light orange, fast yellow G, fast light yellow 3G, acid violet, azofuchsine 3B, brilliant azofuchsine 2B, brilliant ponceau 5R and naphthol green B paste.

The chief interest which these lists will have for our Colonies and Dominions lies in the approach to completeness of the range for the purposes of leather dyeing, paper staining and wool dyeing, which require perhaps the biggest quantities; and there can now be only a small fraction of the demands of these industries which cannot be fully met.

National Dyes, Ltd.

We understand from National Dyes, Ltd., dyestuff and intermediate manufacturers, whose head offices are at 70, Lombard Street, London, E.C.3, that they are in a position to supply both for the home and export trade such direct colours as chrysamine G and R; direct brown RN, BB, and RR; direct orange R; direct blue 2B; direct violet B; benzo purpurine 4B; Congo red; direct scarlet O, S and R; direct yellow A and direct black and pink. Wool colours are available in fast red A chrome black 6B carmoisine; acid scarlet O, S and R; azofuchsine: and orange II. Their range of sulphur colours includes sulphur black, sulphur brown B and sulphur dark brown, while such basic colours as chrysoidine Y and R, and Bismarck brown R and Y are stocked. The leather colours consist of leather brown I, II and III, and intermediates include "H" acid, sulphanilic acid, naphthionic acid, naphthionate of soda, paranitrotoluol and orthonitrotoluol. This range of colours will, we understand, be augmented during the present year.

British Chemical Industry

Cellulose Acetate and Artificial Silk

To meet the vital necessity of ensuring the country's supply of cellulose acetate and its solvents, the works of the British Cellulose and Chemical Manufacturing Co., Ltd., were installed at Spondon, near Derby, in 1916.

Cellulose acetate, from which dope for aeroplanes and airships is made, has proved itself to be of the utmost value in the aircraft industry, and the conception of laying down and completing the works in the stress of war, and the establishment of a new key industry of vital importance in war, with huge potentialities in peace time, was a marvellous achievement; it was due to the genius of Doctors Henry and Camille Dreyfus Before the war the value of cellulose acetate was appreciated by few in this country, and there was nobody capable of dealing with the enormous demand which the Air Force programme created.

The works actually built covered 240 acres—the various plants forming the most up-to-date chemical factory in England. The cost of establishing this industry approximated three and a half millions. Their power plant, carbide and liquid air plants are the key to an enormous range of synthetic products, and it may be mentioned that the carbide plant is the largest in this country. The aspirin plant was designed to turn out 300 tons per annum. A large plant for the manufacture of triphenylphate, tricresylphosphate, cellulose acetate, aspirin, acetic acid, acetic anhydride and carbide, places the company in a position to compete with the Continent, while the products have already obtained a world-wide reputation for quality.

At the termination of the war the problem of utilising the chief product, cellulose acetate, as a commercial product, for peace purposes, engaged the attention of the staff. The wonderful success which attended the experiments in the use of cellulose acetate for artificial silk encouraged the directors of the Company to devote their energies mainly to this product. Their enterprise in this direction has been more than justified, and it has been found that the silk produced from cellulose acetate actually impinges on the field of real silk.

The general belief has been that while acetate of cellulose was a perfect raw material for the manufacture of artificial silk, it suffered the serious drawback of being difficult or impossible to dye.

Contrary to this opinion, the Britsh Cellulose Company have proved that, after most exhaustive trials extending over a considerable period, during which the most minute studies and tests both in the technical laboratories and in bulk have been made, the silk can be dyed in a very easy manner. The operation can be carried out by any dyer in this country without special skill or pre-treatment and by direct dyeing with practically all dyes. The basic, the azo, the acid, alizarine, and other dyes can be used successfully, and in each case the resultant dyed silk is fast to light and is washproof.

The dyed silk has been submitted to tests of ten hours under the Quartz lamp—tests which would practically destroy basic dyes on real or artificial silk, and the results have shown that the silk is not affected in any manner. One outstanding characteristic observed in dyeing the silk is that all dyes are directly absorbed without any pre-treatment whatever. Dyes which are insoluble in water, immediately dye British cellulose silk on immersion in the bath.

The action of the dyes in the case of cellulose acetate silk is believed to be a rare chemical affinity and not a physical absorption. Another interesting feature is that the basic dyes which are not fast to light or washproof, become so when applied to cellulose acetate silk.

Cellulose acetate silk, both dyed and undyed, has a lustre which is excellent, and it possesses a scroop equivalent to that of natural silk. Many and continuous tests in weaving cellulose acetate silk, both dyed and undyed, have been carried out by large manufacturers of silk goods, piece goods, and ribbons, and the reports are of the most satisfactory character. Indeed, these manufacturers have expressed their astonishment at the easy manner in which the product has worked in their textile machinery. Whether they were using it for warp and weft at the same time, or for one of these, or whether they were working in conjunction with natural silk, the results have been excellent. The absence of breakages under trying conditions has commended it highly to the workers.

This feature is due to the great elasticity of cellulose acetate silk. In this respect it even excels natural silk. This feature permits the silk to be woven on looms running at the highest speed.

Plant has also been installed for the manufacture of non-inflammable celluloid, termed "celastoid." This product has all the advantages of celluloid without the great disadvantage of high inflammability. Such a material is of great value to the celluloid trade, where the high price of camphor has seriously restricted the manufacture of celluloid. The day is not far distant when the use of dangerous highly inflammable celluloid will be prohibited.

The marvellous insulating property of cellulose acetate silk or sheeting, is a factor that has aroused great interest in the electrical and allied trades, and the long-sought-for non-inflammable accumulator boxes, wind screens, and a multitude of other articles of necessity will shortly be placed on the market.

It may be safely claimed that the British Cellulose Company's turnover—from a vital war product to a peace time art—from aeroplane dope to silk stockings—is one of the most striking examples of the utilisation of war material.

Ammonia and Tar Products

The firm of Brotherton & Co., Ltd., City Chambers, Leeds, is probably the largest concern in the United Kingdom engaged in the manufacture of ammonia and tar products, its operations being conducted at no less than a dozen different establishments and calling into requisition the services of an executive and industrial staff of about 2,000 persons. The business had its inception in 1878, the limited liability constitution being adopted in 1902, and the founder is still at the head of its administration in the person of Colonel Sir Edward Allen Brotherton, Bart., M.P., chairman of the present company.

Specialising in ammonia and tar products for practically all purposes, the company possess exceptional facilities for satisfying both the technical and the commercial requirements of consumers. Their name has been for years past an accepted assurance of quality, and no firm, British or foreign, is better prepared to contend successfully with the exigencies of a competitive market.

After satisfying home requirements, the enormous output of their ammonia works, which takes the form of liquid ammonia in all strengths, carbonate of ammonia, muriate of ammonia and sulphate of ammonia is exported, and the extent of such business may be realised when it is mentioned that frequently a vessel's entire capacity is reserved for one consignment of liquid ammonia. The war's unprecedented demand for high explosives, and the consequent call for benzol and toluol oils, for which the firm has had recovery plant in operation since early in the history of the industry, found Messrs. Brotherton prepared in 1914 to apply themselves wholeheartedly and at once to the recovery on a large scale of these products for national purposes.

Not only the light oils such as benzol, toluol, xylol and solvent naphtha are obtained in the pure state, but carbolic acid, orthocresol, metacresol, paracresol, naphthalene and anthracene, products of importance to the dye industry, are produced. The heavier tar oils, such as creosote, which in normal times are principally used for wood preservation purposes, have, under existing conditions, assumed great importance as fuels. Amongst the simpler derivatives of the coal tar products, the firm manufactures disinfectants of both the emulsifying and non-emulsifying type.

From coal tar to dyes is a natural development, and Messrs. Brotherton were quick to place their resources at the service of the country. In 1917 Sir Edward Brotherton purchased from the Public Trustee the Mersey Chemical Works, Port Rainbow, Cheshire, a factory formerly owned and worked by a combine of important German colour firms.

With modern coal-tar distillation plant, producing pure coal-tar products on the one hand, and what is probably the best equipped colour plant in the country on the other, it only remained to the firm to bridge over in its own factories the gap between coal tar and dyes.

The firm has enlisted the services of expert colourists and research chemists, and the results of their work are seen in the long list of new colours which have been produced. An especially fine series of metachrome colours for wool-dyeing—a series which is more complete than that of any single German colour firm—has been completed. These colours are all marked by exceptional fastness to light, milling and scouring, and they are recommended with the utmost confidence. Besides these colours there is an excellent range of bright acid colours, afterchroming colours and sulphur blacks.

The Port Rainbow factory also contains an up-to date plant for the production of solid sodium hydrosulphite for which there is great demand in dyeing with vat colours, especially indigo, and for most bleaching processes, *e.g.*, straw, sugar, glue. Messrs. Brotherton & Co., Ltd., inform us that they are the only British firm manufacturing this substance They also manufacture formosul and zinc formosul (formerly known as rongalite and decroline), substances in great demand for discharge printing and bleaching; and rubol (formerly burmol), a powerful cleaning and bleaching agent of great value to laundries.

Chemical Engineering Developments

Ironac in Acid Manufacturing Plant

Among those whose services were early requsitioned during the war were experts in the manufacture of explosives and in explosives plant. Haughton's Patent Metallic Packing Co., Ltd., 30, St. Mary-at-Hill, London, E.C.3, who are specialists in sulphuric acid and nitric acid plants, and who hold the Haughton-Tungay Patents, which are incorporated in the systems of nitric-acid manufacture and concentration and condensation of sulphuric acid, were amongst the first to be consulted. At the time of the outbreak of the war this firm was building nine nitric-acid plants for Germany, all of which were completed, and turned over for the services of our own Government, and for some considerable period further installations of nitric-acid plant were being manufactured and installed at the different large explosives works at the rate of approximately one per week.

In addition to our own Government, considerable plant was being installed for the French and Belgian Governments, and some very large nitric-acid plant was made for Russia in the early part of the war when this country had to face the task of providing her with the means of producing munitions on a large scale.

Plant for the concentration of sulphuric acid so as to produce large quantities of acid of high strength, for the production of such high explosives as T.N.T., has been laid down by this firm during the war at most of the large explosives concerns throughout this country, the work being done with the greatest despatch.

A further problem which was dealt with was the recovery of waste acids from the manufacture of high explosives, as large quantities of waste acids are produced from these processes. There has been designed and equipped, plant dealing with these waste products, recovering and regenerating both the nitric and sulphuric acids for further use in the production of explosives.

It will be recollected that Mr. Tungay displayed at the Chemical Engineering Exhibition in 1913, a number of acid-resisting castings in "Ironac," a hard and homogeneous iron alloy which has been widely adopted by chemical manufacturers and by others in plant designed for the manipulation of corrosive acids. Corrosion-tests were made with pieces taken from large vessels constructed of "Ironac" and these experiments showed results of a convincing character. With sulphuric acid at 65 per cent., which had been boiled at 150°C. for 72 hours, no corrosive effect was perceptible. In the case of nitric acid at 90 per cent., the temperature and boiling period being the same as in the previous instance, the loss by corrosion was not more than 0·074, while with mixed acids, 65 per cent., H_2SO_4, 2 per cent., HNO_3, 33 per cent. water, subjected for 24 hours to a temperature of 150°C. no corrosive effect was discernible.

In the manufacture of propellants and high explosives, and particularly in nitric acid condensation plant, this metal played no small part in the course of the war. The rapid construction of plant of a large capacity would have been impossible without a satisfactory acid resisting metal, since available substitutes, such as pottery, require a considerable time to manufacture. There was also an important and valuable reduction in the time absorbed in the chemical process, and a charge of nitric acid which usually takes thirty-six hours to condense in a plant constructed of pottery, was condensed in sixteen hours in one in which "Ironac" was used.

The Houghton-Tungay system is employed not only in connection with explosives, but also in the manufacture of anilines and in other chemical processes. The design of the system is of such a character that a minimum of brickwork is required, and the entire plant is open to view. In most cases the cascade concentration principle requires a long stretch of ground for the descending tiers, but a special design in which the cascade returns on itself obviates this, and provides an arrangement which is eminently suitable in cases where economy of space is an important factor. The out-put of the standard design is from five to twenty tons, according to size, in the course of twenty-four hours.

Haughton's "Regulus" acid pumps for sulphuric acid, and the high-lift patterns for acid towers, represent an important departure on the part of this firm of chemical engineers By the use of multi-stage pumps on the turbine or centrifugal principle, a high lift can be obtained with moderate working speed, and considerable economies can be effected.

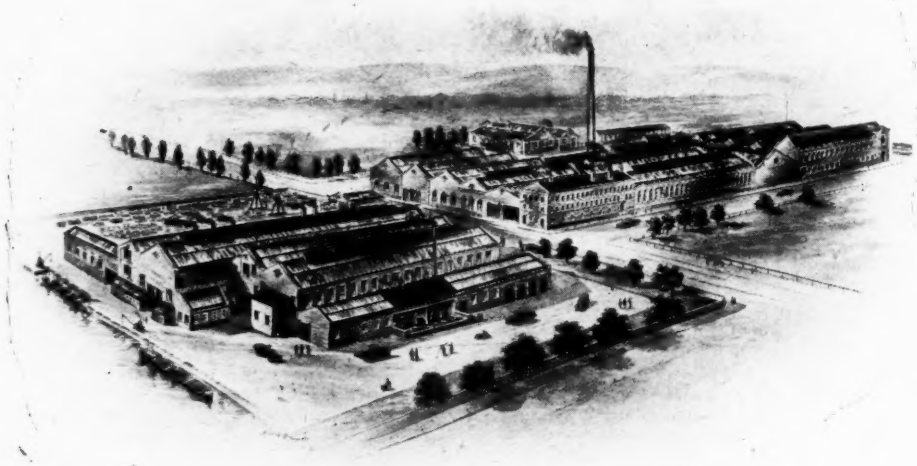
These pumps, it is asserted, have marked advantages over compressed air, and the old-fashioned acid egg, and can be driven from electric motors. The acid egg system gives an efficiency of only 15 per cent., against that of from 47½ per cent. to 50 per cent., which follows from the use of the multi-stage centrifugal pump.

A continuous efficient nitric acid pump constructed of metal has marked advantages which the chemical manufacturer can appreciate.

Hydro Extractors and Centrifuges

The firm of Thomas Broadbent & Sons, Ltd., is one of the most notable of those by which the widespread reputation of Huddersfield has been built up and consolidated. Its history, covering more than half a century, embraces the period during which this busy Yorkshire town has added to its textile fame that of an extremely active and progressive centre of mechanical engineering. "Broadbent's" were probably among the first to make the name of Huddersfield known in distant lands in connection with a range of machinery for which the town is internationally celebrated to-day.

It was in 1865 that the large business centre at the Central



BIRD'S EYE VIEW OF THE CENTRAL IRONWORKS, HUDDERSFIELD.

Ironworks entered upon its career of progressive growth and prosperity under the auspices of Mr. Thomas Broadbent. Remaining in the hands of the same family from the first, it has so increased that the founder's original small workshop now forms but a tiny unit in the extensive group of buildings constituting the present premises, where some 600 hands are now employed, assisted by a plant of the most modern type adapted to the various processes of an industry of very comprehensive scope.. The works, which are illustrated on this page, are the outcome of continuous developments in the promotion of which the founder's two sons, Messrs. William and Horace Broadbent, have been untiringly active for many years past.

To attempt to summarise the productions of the firm would be practically impossible, but mention of such productions as electric overhead travelling cranes from 1-ton to 100-tons capacity; electrically operated steelworks plant, ladle cranes, charging machines, stripping, magnet, Goliath and forge cranes; electric capstans, winches and haulage gear; hydro extractors for every purpose in the textile, dyeware, chemical and sugar industries; and special centrifuges for the chemical industry gives some idea of the manufacturing resources.

For nearly 30 years Broadbent's have specialised in the manufacture of electrically operated overhead travelling cranes, and they claim that no firm has been more successful in producing cranes of this class precisely adapted to the multifarious needs of modern industry.

No less famous at the present time is their highly specialised steelworks plant, which, in the several forms above mentioned, may now be found in regular operation at many of the largest steel-producing establishments in this country and abroad. Again, in the matter of hydro extractors and centrifuges, the results of this firm's research have been remarkable, and it is an open question whether the name of Broadbent is not more

widely known in this regard than in connection even with electric travelling cranes.

The laboratories at the Central Ironworks have solved many of the practical problems relating to centrifugal force, and it is interesting to note that they are the largest makers of hydro extractors in the world, and have supplied over 10,000 machines, embracing 33 types, to users in all quarters of the globe. Their improved water-driven machine with patent control valve is perhaps the most conspicuous of their later achievements, and has, apparently, a great future before it.

The valuable service rendered to industry by this firm is attested by the far-reaching scope of its trading relations, which are maintained, not only through all the usual commercial channels of communication with home and export markets, but also by means of agencies in India, France, Belgium, Norway, the U.S.A., Brazil, New Zealand and Ireland, in addition to branch offices in London, Newcastle-on-Tyne and Cardiff.

Power Alcohol Plants

At the present time, with the high cost of petrol, there is considerable activity in connection with power alcohol plants. In the earlier experimental plants little attention was paid to controlling the temperatures at which the fermentation took place, but scientific experiment has shown that the results obtained are very largely affected by the temperatures of the fermenting vats, and consequently refrigerating plant to control these temperatures is required, particularly in places where there is considerable shortage of water. The well-known firm of Peter Brotherhood, Ltd., of Peterborough, have supplied several interesting plants for this purpose. Whereas in the cruder plants the CO_2 evolved was allowed to escape, it is now being collected, compressed, condensed and run into bottles for distribution to mineral water manufacturers, refrigerating engineers and for other industrial purposes.

The present cost of CO_2 in the liquid form is over 2d. per lb. in the most favourable districts, and very much over this figure in places far from sources of supply, and the firm have found that there is a very big demand from the majority of up-to-date distilleries for this by-product plant. In many cases the profits from this plant are sufficient to wipe out the initial cost of the installation within the first three or four months.

At the present time the liquefaction of air for the production of liquid oxygen is being used extensively, and Messrs. Brotherhood have supplied a large number of plants for this purpose. The plant is capable of manufacturing liquid oxygen suitable for the manufacture of explosives for blasting purposes, and this cheap and new type of explosive appears to be coming to the fore rapidly both in this country and the Colonies. The explosive is made by merely pouring liquid oxygen over a charcoal cartridge, and the method is said to be absolutely safe and inexpensive.

Another interesting development is the possibility of distributing high-pressure lighting gas over long distances, and we understand from the firm that they can now undertake to distribute this gas over a distance of 200 miles for an inclusive cost of 6d. per 1,000 cubic ft. This figure includes capital, depreciation on mains and plant, all working expenses, cost of laying mains and charging. It will be seen, therefore, that under present conditions it is cheaper to manufacture gas at the pit head or obtain it from a natural gas source, such as is existent in certain of our Colonies, and to distribute it by means of high-pressure mains to the surrounding townships, than to perform the distribution by transmitting coal to small gas works situated in the towns. Owing to the high cost of ammonia, several gas works in this country have recently been equipped with complete recovery and liquefaction plant for manufacturing anhydrous ammonia suitable for refrigerating purposes.

Railway Facilities for the Chemical Industry

The link between the chemical industry and the users of the products which it manufactures is the railway. A feature of most chemical manufactories is the complete installation of private sidings, which enable railway trucks to be run right into the works, there to be loaded for their ultimate destination without double handling. It is on this point that the activities of the Bute Works Supply Co., Ltd., touch the activities of the chemical industry, the company supplying the necessary rails, sleepers, points and crossings, switches and all other permanent-way materials for the construction and repair of the sidings.

Specialising in industrial railway equipment of all kinds, the B.W.S. Service will be found most useful in numerous other directions, such as the supplying of railway wagons for main-line purposes, locomotives for works purposes, and wagons, both side, end and all-round tipping, together with the necessary track for inter-shop communication, and the moving of materials from place to place in the works. There is, in fact, no section of industrial railway equipment service that the Bute Works Supply Co., Ltd., does not touch.

Others of its activities include a large amount of wagon repairing and also a separate minerals department to handle coal, coke, iron ore, slag, clinker and scrap metal.

Correspondence is invited on any subject whatsoever connected with industrial equipment, the head offices of the company being at Cymric Buildings, West Bute Street, Cardiff. A branch has also recently been established in London at 40, Pall Mall, S.W.1.

Plant for Corrosive Liquids

One of the principal industries controlled by Guthrie & Co., of Accrington, Lancs, is the manufacture of engineering plant for dealing with large quantities of corrosive liquids. They manufacture pumps of the armoured ceratherm type with a capacity up to 500 gals. per minute. These pumps can be made enormously strong, for dealing with gritty liquids, and even the impellers may have steel interiors, although the liquids passing through the pumps touch no metal of any description. Large-capacity pumps are being prepared for acid-mine waters, the difficulty of designing a ceramic material in suitable form for obtaining the strength necessary for successful pumping having been completely overcome.

The firm also manufacture vats lined with earthenware in such a manner that the earthenware placques cannot be detached from the sides by ordinary mechanical strain or violent handling. These linings, which should not be confused with thin enamels, are exceedingly thick and strong and made of inert and heat-proof material joined together to give a one-piece effect.

The possibility of applying this system to the export of large quantities of acid by means of suitable acid tanks is of considerable importance to Colonial users of acid.

Messrs. Guthrie are also about to put on the market a continuous filter of centrifugal type which will be capable of handling large quantities of liquid with a comparatively small size of apparatus. Systems of evaporating highly corrosive liquids, both under vacuum and at atmospheric pressure, are available in plant which is entirely inert to any chemical.

Electrodes for Steel Furnaces

A prominent part in the supply of electrodes for plants in the British Empire is being played by E. G. Acheson, Ltd., of 40, Wood Street, Westminster, London, S.W.1. One of the works, situated in Canada, supplies graphite electrodes for most of the electric steel furnaces in operation in that country, and we understand that there are also several companies operating small electrolytic plants which make use of Acheson electrodes. These electrodes are supplied exclusively to Australian plants, while an installation in New Zealand has made use of them for the production of lead sulphate by passing crushed galena ore through an electric arc.

Although there are at present no electric furnaces in India, there is a small number of equipments of electrolytic cells for the production of hypochlorites used in bleaching processes. These equipments, we understand, are made in England, and are fitted with Acheson electrodes, as are the electric furnaces in operation in South Africa. We have before us several booklets dealing with these electrodes, with electric furnaces, and with brass melting, which will be supplied by the firm to interested enquirers.

Cylinders for Compressed Gases

Considerable advance has been made during the past few years in the manufacture and production of weldless-steel tubes. The Chesterfield Tube Co., Ltd., is now in a position to produce solid-drawn weldless-steel tubes up to diameters of 24 in. Recently, large orders have been executed for home and abroad, the tubes having been required for various purposes, including steam-heating systems, hydraulic mains and oil-well casing. Locomotive boiler tubes, superheater tubes and smoke tubes are in constant demand, and the firm has established a good connection for these products. Cylinders for compressed gases are also made at Chesterfield, and it is worthy of note that extreme care is taken to supply cylinders having an exceptionally good finish. The formation of the base and neck for these containers involves considerable skill, and this company has been eminently successful in these important details.

With the increased demand for acetylene, specially designed cylinders have been placed on the market, whilst cylinders for oxygen, hydrogen and carbon dioxide have been standardised to meet the requirements of different specifications. Diesel engine starters are a specialised product, and large air vessels having a diameter of 19 in. and length up to 15 ft. are constantly being supplied. The output during the past 12 months is stated to have been a record one, and it is anticipated that the results for the present year will be even more successful.

Stills and Condensers

BENNETT, SONS & SHEARS, LTD., of 43, Shoe Lane, London, E.C.4, who have been established for over 120 years, are continuing the manufacture of their well-known special apparatus and plant for pharmaceutical and chemical laboratories and works. Their productions, which they assert are all of the very highest class, include copper and iron vacuum pans and vacuum stills (fitted with their well-known type of dry-air pump), stills for the production of pure distilled water, and all forms of stills and evaporating pans as generally used in the business of a manufacturing chemist. Various types of stills used for the production of essential oils are also supplied, as well as copper extraction apparatus for drugs working on the Soxhlet principle.

The firm are also the sole proprietors and makers of Bennett's patent "Ideal" annular condenser, which has superseded the old-fashioned worm and tub condenser. We understand that a large number of these condensers have been working in this country for years, and that they are also in use in India and the Colonies.

Another of the firm's specialities which is coming into increasing use is the Shears patent mulser. This machine treats emulsions so as to render them perfectly homogenous.

Fully illustrated catalogues describing these specialities in detail can be had upon application.

Labour-Saving Plant

Unloading, conveying and storage plant is manufactured by Strachan & Henshaw, Ltd., of Whitehall Iron Works, Bristol, the firm having specialised in this class of work for many years. Since the beginning of 1914 they have made considerable developments in the high-speed telpherage system, particularly in regard to the requirements of chemical works for labour saving in the handling of materials. The illustrated booklet, which has been issued by the firm, gives particulars of some important undertakings which will be found of general interest.

Laboratory Apparatus

Chas. W. Cook, Ltd., of 174, Oxford Road, Manchester, who are makers of a great deal of apparatus used in the chemical industry, specialise particularly in apparatus suitable for chemical laboratories, and which they describe as "intermediate stage" apparatus, as distinct from the purely small laboratory apparatus, it being, so to speak, midway between the laboratory and commercial stages. In addition to such apparatus as autoclaves, stills, sulphonators, nitrators, reduction pans, they manufacture the well-known "Curnon" steam meter, Mahler-Cook bomb calorimeter, high-pressure gas apparatus, hydraulic pumps, electric furnaces, and much work of a very varied character used in the chemical engineering and allied trades. Special arrangements have been made by this firm for export, and all consignments are packed and delivered, f.o.b., Manchester, or other British docks. They also inform us that literature dealing with their manufactures will be forwarded to those interested on request.

The Price of Soda Crystals

Six Firms Fined Under the Profiteering Act

AT the Manchester City Police Court on January 19, at the instance of the Complaints Committee under the Profiteering Act, five firms were proceeded against for making an unreasonable profit on the sale of soda crystals, in contravention of the Act.

William Bostock & Sons, Ltd., Ashton-under-Lyne, were alleged to have sold soda crystals to the Textile Colour Co., Manchester, at £10 per ton, it being alleged that the crystals had been purchased by the respondents for £5 10s.

The managing director of the respondent firm said that when the complainants' representative called upon them with a view to purchasing soda, the supplies of that material were very short, but as complainants' representative appeared to be very anxious to obtain a supply he consented to supply him at the risk of disappointing his regular customers. It never occurred to him that there was any element of profiteering in the matter. The representative did not raise any dispute about the price called and, on the contrary, appeared to be quite satisfied with the purchase.

Thomas Bennett & Co., of Stockport, were summoned for selling soda crystals, which they had bought the same day for £9 5s., at £12 5s. per ton.

The John Smith Oil Co., Ltd., of Ducie Street, Manchester; Standing Brothers, of Parliament Street, Colne; and F. Duckworth, of Parliament Street, Colne, were all summoned for similar offences. Although the amount of profit varied in these transactions, it was submitted by the prosecution that the allegations made in the summonses had been made out. Mr. Duckworth, giving evidence,, asserted that this was the first instance, in the 31 years in which he had conducted the business, that any question had been raised as to his conduct of the business. Mr. Burgis (for Mr. Duckworth) submitted that in this case a reasonable profit had been charged.

William Bostock & Sons, Ltd., the John Smith Oil Co., Ltd., T. Bennett & Co., and Standing Brothers were fined £20 with £10 costs, and Mr. Duckworth was fined £10, with £10 costs.

Before the Stipendiary at Liverpool on January 21st, at the instance of the Board of Trade, Heaths (London) Ltd., were summoned for having sold to Partridge, Naylor & Co., 21, Harrington Street, Liverpool, 5 tons of soda crystals at £12 18s. per ton, giving a profit of £5 14s. per ton which, it was alleged, was an unreasonable percentage.

For the prosecution, Mr. Howard Roberts said the proceedings were taken under Section 1 of the Profiteering Act, 1919, and were the result of investigations made in London. Before the war this class of article was liable to any speculative transaction, but in those days, when the demand accommodated itself to the supply, the margin of profit was small. Last March the home demand increased enormously, and a number of speculative transactions took place. The two firms who controlled the manufacture were the United Alkali Co., Ltd., and Brunner Mond & Co., Ltd., and they practically stopped their export trade and arranged that the home market should have preference regarding supplies. The price at which the manufacturers sold this article was £5 10s. per ton, but the price increased as the commodity passed from hand to hand until the unfortunate retailer had to pay anything from £16 to £20 per ton.

In the present case the defendant firm purchased 5 tons of washing soda from various sources for £36, the average price per ton being £7 4s. They sold this soda to Partridge, Naylor & Co. for £64 10s.—a profit of 44 per cent.

Mr. Kent, for the defendants, pleaded the increased cost of labour, rent and establishment charges.

A fine of £100 with 10 guineas costs was imposed.

The Economic Use of Fuel

By David Brownlie

A LECTURE under the above title was given at the Manchester Municipal College of Technology on Thursday, January 20th, by Mr. D. Brownlie, B.Sc. Hons. (Lond.), F.C.S., A.M.I.Min.E., A.I.Mech.E. (Brownlie & Green, Ltd., London, Manchester and Glasgow) to a large audience.

The lecturer first dealt with the question of the steam boiler, and pointed out that the tendency in their design was to bring the hot gases into more intimate contact with the water, and at the same time to increase the circulation in the boiler. He showed the general course of evolution of the steam boiler from the old-fashioned "Waggon" boiler, then to the "Egg-ended" boiler, followed by Trevithick's famous invention of the "Cornish" boiler, which latter developed into the present "Lancashire" boiler, and then on to the "Water-tube" boiler. The "Lancashire" boiler may still be called the standard boiler of Great Britain, this statement applying quite as much to the chemical industry as to any other.

The general principles of the "Water-tube" boiler were, of course, well known. Mr. Brownlie showed a number of slides of modern "water-tube" boilers, dealing more particularly with the "Babcock and Wilcox," the "Niclausse," the "Woodeson" and the "Kestner" boilers.

The "Lancashire" boiler had proved itself to be, for many years, a very efficient steam generator, and it could hardly be said in the chemical industry that much coal was being wasted because of its use.

Efficient Firing

The lecturer then dealt with the savings which could be effected by efficient firing, and stated that there was a considerable difference of opinion as to the efficacy, or otherwise, of mechanical stoking as applied to "Lancashire" boilers. For "water-tube" boilers mechanical stoking was, of coursel essential because of the large size of the units. The general principles of mechanical stoking, both coking and sprinkling types, were then explained, and Mr. Brownlie showed slides of a number of representative stokers, including "Proctor," "Bennis," "Underfeed," "Chain-grate," "Underfeed travelling grate," and the "Erith Riley." The lecturer exhibited a slide showing the essential details of the figures obtained by him during the course of an investigation of over 80 boiler plants, mechanically fired. The average net working efficiency of these 80 plants, mechanically fired, was found to be only about 59 per cent., whereas 350 boiler plants, hand-fired, gave about 62 per cent. The net result, therefore, was found to be that mechanical stoking, with the present methods of running boiler plants, was actually giving worse results than hand firing.

Economisers

Mr. Brownlie then dealt with the question of economisers, and pointed out that the chemical industry was not making sufficient use of economisers. The average reduction of the coal bill in the chemical industry, by means of economisers, was only about 10 per cent. As this figure should be 17·5 per cent., the chemical industry was losing about 7½ per cent. of its coal bill. A general description of the economiser was then given, and a number of slides exhibited showing details, together also with actual figures obtained as the result of the lecturer's investigation of 155 boiler plants fitted with economisers. The disadvantage of the economiser was that it choked the draught, because it reduced the temperature of the flue gases, and it was for this reason that mechanical draught was an advantage over chimney draught. There was also increased trouble when the feed-water contained much scale.

Feed-Water Regulators

Feed-water regulators were advantageous because they ensured a regular feed-water supply, and kept the level of the boilers constant. For "water-tube" boilers they were of course essential, owing to the small reserve in the boiler. Mr. Brownlie then showed slides giving details of two typical feed-water regulators, namely, the "Crossley" and "Ronold Trist" regulators.

Mechanical Draught

Generally speaking, mechanical draught was very much superior to natural draught. It enabled the full amount of heat to be taken out of the flue gases by the economiser, a very thick fire to be used, with consequent high percentage of CO_2, and was under perfect control. The details of induced draught installation having been explained, the lecturer showed a number of slides of the productions of Davidson & Co., Ltd., of Belfast, and Messrs. Musgrave, of Belfast, as being typical.

Steam Jets

Consideration was also given to the question of steam jets, and slides were shown giving detailed figures of investigations carried out by Mr. Brownlie with respect to 19 different forms of steam jet furnaces, both hand and mechanically fired. The net result of these investigations was that the amount of steam taken by these jets was very much greater than was generally supposed, the average being 6.6 per cent. of the production, and individual plants varying from 0·5 per cent. to 21·5 per cent. In the chemical industry, taking all the plants together, there was no less than 6·0 per cent. of the steam production used by the nozzles, which was a very serious loss, corresponding to at least 4·0 per cent. of the coal bill.

Feed-Water and Boiler Scale

The average hardness of the water going into the chemical industry was about 12 grains per gallon, which was about the average for all other industries. This corresponded to no less than 2,000 tons of scale per week deposited in the boiler plants of Great Britain. It was absolutely necessary, for efficient results, to treat the feed-water so that the total hardness was not more than about 6 deg. or 7 deg., and it was probable that the chemical industry generally was losing about 5·0 per cent. of its coal bill by neglecting to take these obvious precautions. This was a matter which occasioned surprise because there were so many chemists engaged in the industry.

The lecturer then explained the chief principles of water softening, and showed a number of slides of the "Paterson," "Harris-Anderson," "Kennicott," and "Permutit" systems of water softening as typical of the rest.

Scientific Control of Boiler Plants

The question of the scientific control of boiler plants was next considered. The most serious loss in steam generation in the chemical industry, as in every other industry, arose from the fact that there were no proper methods of controlling boiler plants.

Mr. Brownlie then gave a detailed explanation of the necessity for installing a combustion recorder, to keep control of the firing, and showed slides giving the essential details of the "Sarco," "Auto" and "W.R." combustion instruments as representative of the 10 or 12 instruments on the market. The actual results for CO_2 obtained in the chemical industry were only about 8·0 per cent., and Mr. Brownlie produced slides giving the detailed figures for different plants. The figure should be about 12 per cent., and it could be stated, therefore, that probably another 5·0 per cent. was being wasted on chemical works boiler plants for this reason. The installation of feed-water meters was absolutely essential to the proper running of any boiler plant, and the lecturer gave full information, accompanied by slides, respecting the "Glenfield-Kennedy," "Leinert," "Avery," "Paterson" and "Kent" types. He stated that probably not 5 per cent. of the chemical works of Great Britain were fitted with meters. The "Avery" coal-weighing machine for taking continuous records of the amount of coal used in large boiler units was also described.

Conclusion

Mr. Brownlie then exhibited three interesting slides giving the detailed average figures for the exact performance of 60 chemical works, 250 works in 27 different industries, with a coal bill of over 2 million tons per annum, and, also 100 collieries, representing many years' continuous investigation work on boiler and power plant operation. The average net working efficiency of the chemical works' plants was 58·0 per cent., the collieries 55 per cent., and the other 27 industries together 60 per cent. This showed, therefore, that the average amount of coal to be saved in the chemical industry on steam generation alone was approximately 20 per cent. of the coal bill, and there was no difficulty in achieving this saving.

The Reduction of Wages

By Ernest J. P. Benn

FOR the past six years wages have been rising very rapidly. The movement has been very general, and until recently nothing has arisen to check it. These advances have been secured by the force of the trade-union movement, which was so strengthened by the withdrawal of labour for the army as to put it into a position where it could dictate its terms.

No serious student of the question can object to high wages as such, and if we admit that civilisation is a process of progress, then we must look forward to an ever-increasing return for honest work done. If we have the welfare of the human race at heart, then we must rejoice in the disappearance of a condition of affairs when capable men could not secure for themselves and their families the ordinary comforts of life. If we merely take a sensible business view, we must admit that high wages, in so far as they represent purchasing power, are altogether good for commerce and industry. There can be no doubt that prosperity is well founded when it starts from the bottom, and a condition of affairs in which the working man is prosperous is one that is very highly to be desired.

A new factor has arisen within the last few weeks which has led many people to suppose that the moment has arrived for a reversal of the process of raising wages. Unemployment has arrived upon a large scale, and is at once attributed to high wages; meanwhile, all the reactionaries rub their hands and delight in the thought that at last wages are coming down. Mr. Roscoe Brunner writes to *The Times* to suggest a statutory reduction of 20 per cent. in everybody's wage, and he merely voices the hope and views of a large section of the public. This attitude is strengthened by the fact that in America reductions in wage rates have been made, and it is to be feared that a certain amount of the closing down which is so prevalent at the moment is prompted by a desire to force along the movement. Some reductions, of course, will have to be made; there are cases where rates have been pushed up to figures which cannot be justified on economic grounds. These are mostly in connection with national and municipal work, where the economic consideration is always overshadowed by the political. There are several classes of unskilled labour which have secured rates of remuneration that cannot last, but that is not to say that the great body of workers as a whole are in receipt of rates beyond those to which they may reasonably aspire, or which they may not hope to improve still further. Employers who are real employers, who take the word employer literally, will be as anxious to avoid any general reduction in real wages as the most enthusiastic of labour leaders.

This question of wage reduction should not be allowed to overshadow the much more important and vital question of work given for wages received. There are very few workers to-day who could not be worth all the money they receive, and a great deal more. Side by side with the increase in wage rates there has all along been a much more dangerous movement for the lowering of efficiency and the reduction of output.

The whole tendency of labour propaganda is to unfit the working man for his work. He is not invited to ask for higher wages by reason of any value which he may be able to give in return, he is invariably taught to regard himself as the victim of an iniquitous system, as the dupe of the capitalists, as the disinherited possessor of wealth, and led to believe that if he will only make himself difficult, he will force others to disgorge that which really belongs to him. When a man gets into this frame of mind, he can rarely be worth even the lowest rate of unskilled pay. He cannot put his heart into his work; he will dawdle and procrastinate, he will make difficulties and will always be suffering from a grievance. The practical result of this frame of mind has been the tightening up of trade-union regulations and the invention of many more of them. So that many classes of workers to-day not only receive double or treble their pre-war money wages, but are prevented from giving in return more than a percentage of the values which they delivered for the old wage.

If employers use the present crisis to effect wage reductions, they are merely storing up trouble for the future. If, on the other hand, the present unemployment trouble is used to remove the frame of mind which makes work impossible and to strengthen that spirit of co-operation between employers and employed which alone can give security to either, then labour costs can come down without alteration in wages rates and we shall be able to flatter ourselves upon real progress.

Society of Chemical Industry

Liverpool Section

A MEETING of the Liverpool Section of the Society of Chemical Industry was held at the Midland Adelphi Hotel, on Jan. 24th, when Dr. STEPHEN MIALL read a paper on "Diseases of Occupation."

The lecturer said that the human body must be adaptable to the conditions under which it had to live, and that certain kinds of employment entailed what might be called "specialised exposure." It is when this exposure is prolonged that danger arises and with some chemicals the danger is worse than with others. Lead, chromium, antimony, cadmium, chlorine, ether, turpentine, tar and acetone were mentioned as typical examples.

Discussing phosphorous poisoning, Dr. Miall pointed out how the substitution of the fumeless form and compounds for the yellow variety had greatly reduced the number of cases, but mentioned that in forbidding the use of yellow, the Swiss authorities had brought about an increase in poisoning because workers, thinking they were then safe, used the compounds with out care.

After speaking of the dangers in products of combustion and how such should be guarded against by adequate ventilation, Dr. Miall went on to lead poisoning with which he dealt at length.

Great progress had been made in reducing lead poisoning which was allowed to grow to huge proportions before being taken in hand. Regulations compelling the removal of dust and the encouragement of potters to use insoluble silicate instead of soluble lead compounds were largely responsible in bringing down lead poisoning from hundreds of cases a year to quite a few.

Progress was largely due to Dr. Legge, Sir Thomas Oliver and other diligent workers, who investigated this problem.

In conclusion Dr. Miall referred to the International Labour Office, which was to consider this question at Geneva, and said that if employers and employees were taken into consideration much good might come of it, but if, as he expected, the subject was treated in a bureaucratic manner, the only result would be the prohibition of all poisonous compounds; this would do no good; valuable work had been done by the Home Office and it was expected that they would continue to extend their help.

Patent Law and Chemical Research

B.A.C. Course of Lectures

A COURSE of six lectures by Mr. Harold E. Potts, M.Sc., has been arranged by the Liverpool Section of the British Association of Chemists, as follows:—

Monday, February 7.—1. The patent as an element of business policy; the business problem.

Monday, February 14.—2. A short general account of patent procedure.

Monday, February 21.—3. Obtaining maximum protection for an invention; the theoretical problem.

Monday, February 28.—4. Accuracy of experimental data and theory in patent specifications; the experimental problem.

Monday, March 7.—5. Validity of patents; the historical problem.

Monday, March 14.—6. The definition of an invention; the problem of language.

These lectures will be delivered in the lecture theatre of the Chemical Department of the University, Brownlow Street, at 7.30 p.m., and are open to all chemists who may be interested, on production of the card of admission to be obtained on application to Mr. A. J. Myles, 12, Gardner Road, Tuebrook, Liverpool. Owing to the limited accommodation available, intending applicants are requested to communicate without delay with Mr. Myles, who will issue the tickets of admission in the order of application.

Negligent Consignment of Chemicals

Firm Fined Under Railway Clauses Act

BEFORE the Stipendiary at Birmingham Police Court on Tuesday, W. & J. George, Ltd., and Raymond Hyde, Arthur Hewitt and James Whitehouse, all of 157, Great Charles Street, Birmingham, were summoned by the Midland Railway Co. for various offences under the Railway Clauses (Consolidation) Act, 1845, Sec. 99.

For the railway company, Mr. Turner said that W. & J. George, Ltd., were manufacturers of scientific apparatus, with premises in Birmingham and London. Hyde was employed by the firm as a despatch clerk, and Hewitt and Whitehouse were packer and assistant packer respectively.

The section of the Act under which they were summoned, said Mr. Turner, made it incumbent on persons despatching parcels by rail to give an exact account of the contents in writing. Penalties were provided in the Act for failure to give an account or for a false account. On December 10, the defendant firm sent two cases to be despatched to Wednesfield, and these cases were alleged on a written form of consignment to contain flint glass.

Shortly after their arrival at the goods depot one of the boxes was found to be on fire, and when the fire had been extinguished it was discovered that the box contained a quantity of dangerous chemicals, including nitric acid, sulphuric acid and hydrochloric acid. Apparently the nitric acid, which was packed in wood shavings, had exploded. Mr. Turner added that there was some special kind of packing for nitric acid, and it was extraordinary that a firm like that of W. & J. George should send nitric acid away packed in wood shavings. When the other box was opened it was found to contain an invoice correctly describing what had been consigned, and 3 lb. of potassium cyanide. It was certain, he continued, that had the fire caused by the other box spread to the one containing the potassium cyanide, a very dangerous poison gas would have been emitted.

The only excuse offered by defendants was that it was a mistake. He must point out that the result of the defendants incorrectly describing the contents of the parcels would have been that the firm would save 75 per cent. of the rates which otherwise they would have to pay.

Mr. CLEAVER, for the defence, said the defendant firm usually carried out their duties in a proper way, and that a mistake had been made by the three men. The parcels were made up to be despatched by train on December 3. Through some mistake the parcels remained in the warehouse till December 10. Evidently the men on noticing their negligence had despatched the parcels by rail without ascertaining the contents. The men had received the strictest instructions regarding the parcelling and delivery of dangerous chemicals.

The STIPENDIARY said it was quite clear that there was no more than negligence on the part of the defendants. It was gross negligence, however, and might have had serious consequences. On each of the two summonses for sending dangerous goods the company were fined £10, Hyde £5, and the other two defendants £3. The firm were also ordered to pay £5. 5s. special costs.

Two Important Events

OUR readers should make a note of the dates between February 10 and March 4 next. The West End of London will contain much to interest them at that time. On February 10 the Efficiency Exhibition will open at Olympia and close on the 26th, and on the 21st of the same month the British Industries Fair, organised by the Board of Trade, opens its doors at the White City and continues until March 4. Those who live in the provinces and can arrange to be in London between February 21 and 26 will be able to visit both "Shows" on the same day, as they are within a stone's throw of each other.

Benn Brothers will be represented at each exhibition. At Olympia their stand is No. 161 in the Main Gallery, and at the White City they will be found in Section "G" stand No. 8. It is hoped that all interested in trade and technical journals or books will inspect the exhibits displayed at these stands.

Re-inforced Concrete

Its Importance in Chemical Engineering

AN interesting address on the subject of the application of re-inforced concrete to general gas works practice was given by Mr. L. H. Thomas, A.M.I.Mech.E. (Nechells Gas Works, Birmingham,) before the members of the Midland Junior Gas Engineers at a meeting at the Birmingham Council Hall, on January 20.

Mr. Thomas said it was essential that the component parts of the concrete should be in correct proportions, and that mixing was a most important matter. The use of reinforced concrete was to be advocated in chemical works because of its resistance to corrosive atmosphere and fumes. Although the cost of re-inforced concrete was considerably greater than that of steel or cast iron, it often paid to use it because of the low maintenance and repair charges. For purifier sheds and boxes, especially cyanide purifiers, where painting and repair costs and also depreciation were very great re-inforced concrete should invariably be used.

In the various by-product plants of gas works there was ample scope for the use of the material, and it should be used in preference to steel or corrugated iron.

Experience, particularly in America, showed the great value of re-inforced concrete for storage tanks for tar, and oil. In the United States re-inforced concrete was successfully used for oil storage tanks up to 43m. gallon capacity. Many exacting tests were made to ascertain the tightness of the tanks. Several kinds of commercial liquids and oils and chemical solutions were used and the penetrations recorded. It was found that for most liquids a good plain dense 1.2.4 concrete was more efficient than any treatment of a slightly poorer concreter. For oil storage R.C. tanks had several advantages over steel tanks. They could be built below ground, thus reducing the risk of fire and the evaporation from them, often a costly item with steel tanks on account of big differences in temperature. Re-inforced concrete was the most suitable covering material for tanks containing ammonical liquor and light oils, which easily evaporated.

Mr. W. J. PICKERING (chairman) who is superintendent of the coal test works, Birmingham Gas Department, said there was not the slightest doubt that the claims of re-inforced concrete on the grounds of durability and economy in regard to gas and chemical engineering could not be overlooked.

Mr. C. F. W. RENDLE (Redditch) said with good concrete, porosity and steel corrosion were almost unknown.

Sale of a Neath Slag Mill

MR. JUSTICE GREER concluded on January 21, the hearing of an action relating to the sale of a basic slag grindery at Neath, Glamorgan. The plaintiffs were the purchasers of the grindery, Thomas Humphrey Jones and Ellis Owen Roberts, of Chapel Street, Liverpool, Richard Owen Roberts and Thomas Samuel Roberts, North Drive, New Brighton and Rees Jones, Sun Street, Birkenhead. They claimed damages for alleged misrepresentation in the sale of the goodwill and assets of the basic slag grinding business, or alternatively damages for alleged breach of warranty. The defendants were the vendors of the business, Tressilian Walter Ranson, of Urmston, Manchester, and Harold Gough, Banister Road, Southampton, who denied that they had misrepresented the business or that there was any breach of warranty.

Plaintiffs alleged that defendants had induced them to buy the grindery by representing that it was capable of turning out 200 tons of ground slag per week, had been doing an average of 180 tons a week of 80 per cent. fineness, containing an average of 22 per cent. phosphates and that a profit of 10s. 3d. per ton had been earned. When they entered into possession of the mill they found, they said, that the machinery (Krupps) was worn out and was incapable of doing what defendants had represented.

Defendants, on the other hand, asserted that if properly looked after the mill was capable of doing and had done what they represented.

A number of witnesses were called by both sides, the hearing having lasted nine days.

Judgment was entered for the defendants with costs.

Chemical Properties of Refractories

Substitutes for Austrian Magnesite

READING a paper on refractories for the iron and steel industries at a meeting of the Staffordshire Iron and Steel Institute, at Dudley, on January 22nd, Mr. W. J. Rees, of Sheffield College, having reviewed the general physical and chemical properties of refractories employed in the production, spoke of the general behaviour of the materials in use. No single type of brick, he said, could be expected to be suitable for use in a variety of situations in a furnace, because the conditions to be withstood were frequently entirely different from point to point in the furnace. The provision and use of refractory materials which would have a long life and so assist in maintaining a continuous output played a very important part in the production of metals. It was not too much to say that the success or failure of metallurgical operations might depend entirely upon the suitability and quality of the refractories used in the structure and lining of furnaces. Modern metallurgical processes were demanding the provision of refractories which would better withstand the severe conditions set up by higher working temperatures or the production of very active slags. It was confidently hoped that the researches which were being undertaken by the Refractory Research Association under the Government scheme, and also in various University laboratories, would point the way to the production of materials which would adequately resist the severe conditions met with in modern high temperature furnaces. One of the most important basic refractories used in metallurgical operations was dolomite.

The growth of the production of iron and steel from our home resources of phospheric ores was giving increasing importance to the supply of basic refractories of high quality. We were fortunate in possessing in this country very large resources of dolomite suitable for the production of dead burned dolomite for the hearths of basic furnaces. In 'pre-war days practically the whole of the magnesite used in the steel industry was imported from Austria, but the stoppage of the Austrian material, due to the war, led to research work being undertaken to utilise efficiently Grecian and Italian magnesite. As the result of this research work it could now be definitely stated that magnesite production and dead burned magnesite of a quality quite equal to the Austrian material were available from Grecian material, the supplies of which were being controlled by British firms.

Import of Dyestuffs

THE Board of Trade again desire to draw attention to the fact that licences are now required for the importation of all synthetic organic dyestuffs, colours, and colouring matters, and all organic intermediate products used in the manufacture of such, and that applications for the licences should be made to the secretary, the Dyestuffs Advisory Licensing Committee, Board of Trade, Danlee-buildings, 53, Spring-gardens, Manchester. Forms of application are available, and may be obtained from the secretary to the committee, but in cases of urgency applications should be made by letter, giving full information as to the kind of product which it is desired to import, the quantity and approximate value, the purpose for which the goods are to be used, and any special reasons why a licence should be granted. A fee not to exceed £5 is charged in respect of each licence granted, but no remittances should be sent on this acount with the original application. The amount due will be notified in each case to the firm concerned.

Japan's Demand for Soda

BEFORE the war all soda required by Japan had to be imported, but owing to the partail stoppage of imports from England the development of the soda industry in Japan was encouraged. With the cessation of imports from England, however, the importation of American soda began and assumed the position of the British soda in the Japanese market. Even after the restoration of peace the American article continued to find its way into the Japanese market in large quantities. With the restoration of shipping facilities the importation of British soda increased and has become more marked since the beginning of the present year. Prior to the war the imports of caustic soda from England were something like 90 per cent. of the total imports, and almost all soda ash required was also imported from England.

British Engineering Standards Association

IN response to a request by the Chemical Engineering Group of the Society of Chemical Industry, the British Engineering Standards Association has now turned its attention to yet another branch of engineering. A largely attended and representative conference was held recently under its auspices, at which it was unanimously decided that a Sectional Committee on Chemical Engineering should be formed. This Sectional Committee, under the chairmanship of Sir Arthur Duckham, K.C.B., was duly nominated, and the first meeting held on November 23rd, 1920. The work which it has been decided to undertake has been provisionally divided into five heads, namely: The standardisation of (*a*) flanges, cocks and fittings; (*b*) materials used in the construction of chemical plant; (*c*) plant used in the mechanical handling and treatment of solids; (*d*) plant used in the mechanical handling and treatment of liquids and gases; (*e*) vessels and vats. The sub-Committees to consider these subjects are now in process of formation, and work will be initiated at the earliest pssible date. Opinion in the chemical industry is, we believe, unanimous as to the desirability of standardisation in these directions, and, judging by the experience of other branches of engineering, the advantages of standardisation will be increasingly realised as the work goes on.

Australian Superphosphate Industry

IN their annual report the directors of the Mount Lyell Mining & Railway Co. observe that the Victorian Fair Profits Commission has placed rather a heavy obstacle in the way of the expansion of the superphosphate industry in Victoria by the too drastic regulation of prices. The directors state that it is necessary that a broad view be taken by such controlling bodies otherwise they discourage the necessary extensions required to meet the growing requirements of the country for superphosphate, and the damage will be discovered too late to avoid a shortage in this very essential material. This is more especially necessary in view of the very heavy capital expenditure required for such undertakings. One or two subsidiary industries have been commenced at the company's chemical works at Yarraville, including the production of caustic soda and hydrochloric acid by electrolysis, and such side industries will be developed as appear justified from time to time. Operations at Yarraville were carried on satisfactorily during the year ended September 30, cost of production being affected chiefly by the increased freight on phosphate rock. Sufficient raw material was obtained with less difficulty than during the previous year, and the prospects in this respect seem better. The output was a record one. The works at Fremantle also showed an increased output, due to the heavier demand for superphosphate in Western Australia. The forecast in the directors' last report as to the increase in the use of superphosphate has been fulfilled, especially in Victoria.

Finsbury College Old Students

A DINNER was held on January 20th, at the Grand Hotel, Manchester, by a number of Old Finsbury College Students, for the purpose of forming a local section of the Finsbury Technical College Old Students' Association. Mr. Eustace Thomas occupied the chair, and was supported by his brother, Professor Miles Walker, Messrs. A. P. M. Fleming, A. G. Livesay, Linch and other prominent local old students. After the dinner and the formal business of establishing the section a short musical programme was rendered. There are now some 28 old students enrolled in this local section, but there must be many more in the Manchester district, and it is much desired that they will communicate with the honorary local secretary, H. F. Coucher, 9, Cartwright Road, Chorlton-cum-Hardy, or with Mr. Thomas.

Free Export of Dyestuffs

Board of Trade's Special Announcement

The Board of Trade issue the following official announcement:—

"BOARD OF TRADE, *Jan.* 27, 1921.

"The Board of Trade (Licensing Section) announce that as from the 1st of February, 1921, the restrictions on the export of Dyes, Dyestuffs and Intermediates will be removed."

Chemical Trade Award

Protest by Employers

A LETTER of protest has been sent by the Chemical Employers' Federation to the chairman of the Industrial Court against the recent award of the court, by which a general advance of wages was given to men employed in the chemical trade. The award, the letter affirms, is contrary to the weight of evidence submitted, and ignores entirely the present state of the industry, and the signatories, Mr. Roscoe Brunner and Mr. R. Lloyd Roberts, chairman and secretary respectively, write: "We would direct your attention to the following:—In Clause 4 of the Award, it is stated that the estimated average pre-war rate for day labourers was 23s. and yet Clause 11 attempts to justify an advance 'on other grounds, as, for example, the unduly low wages which prevailed prior to the war.' As chemical trade rates before the war were among the highest obtaining for general labour, we take exception to their being described as 'unduly low.' Clause 4 also states that the estimated average wage of day labourers at present is 71s. 6d. per week of forty-seven hours. We suggest to the Court that this rate compares very favourably with that paid to a similar class of labourer in any other industry.

"We have actually compared our rates with those of twenty-five other industries, and we find that before your award was issued, we were higher than sixteen of them, whereas now our rate is higher than that of twenty-two of the other industries, and equal to the remaining three. We suggest, therefore, that our original rate was reasonable and did not justify an advance in the present state of the trade. Your award takes no cognisance of the advances given in various ways during the war: (*a*) actual increases of wages to day labourers of 210.87 per cent. over pre-war; (*b*) reduction of working week from fifty-three or fifty-four hours to forty-seven without loss of pay; (*c*) payment of overtime to shiftman for week-end work, bringing their wages to 190 per cent.over pre-war figures; (*d*) a week's holiday annually with full pay (conditional on good timekeeping).

"We submit that very few other industries have given as much to their workers. We greatly fear that inaccuracies and inconsistencies such as we have shown to exist in the present award, when coupled with such complete disregard to the national situation as this award evidences, will endanger very appreciably the existence of the Industrial Court, and will certainly effectively preclude it from fulfilling the happy functions for which its sponsors hoped."

The German Dye Claims

Non-Delivery of Synthetic Indigo

EVIDENCE of an interesting kind was given on Wednesday when Mr. Justice Russell continued the hearing of the claims by the Calico Printers' Association, the Indigo Buying Amalgamation, and the executors of Thomas Welch, for damages for the non-delivery of large quantities of synthetic indigo by Meister, Lucius & Brunning, Ltd., from their Ellesmere Port works under pre-war contracts. The respondent was Sir William Plender, G.B.E., controller of the company.

Mr. PERCY ASHLEY, an assistant secretary of the Board, said his department was not concerned with the affairs of Meister, Lucius & Brunning, Ltd., and Sir Wm. Plender appealed to him from time to time for help in getting materials to enable the factory to carry on. Mr. DOUGLAS HOGG, K.C. As far as you could judge did he not do all that it was possible to do to secure the continued manufacture of synthetic indigo at the works? WITNESS: I am quite satisfied that he used every possible endeavour, and brought every possible pressure to bear on the Government to assist him. The Board of Trade, he added, did all they could to get further supplies of aniline oil and they failed.

Mr. GOWER, K.C. (cross-examining): If the Board of Trade had prohibited the exportation of aniline oil could supplies have been obtained? WITNESS: The Board did prohibit it, and after that the difficulties were not less than before. The prohibition was taken off, but owing to the changing condition of the war it was re-imposed.

Counsel put to the witness figures showing that the export of aniline oil rose from 1,981,000 lbs. in 1914, to 3,394,000 in 1918, and Mr. Ashley replied that large quantities were exported under license to Switzerland for the making of dyes which would come to this country. Aniline oil was never under Government control. There were also large exportations of sulphuric acid to the Allies for the making of explosives. COUNSEL: To Mexico for instance? I don't know about Mexico. It depends what it was needed for.

Mr. JAMES FALCONER, of Edinburgh, late M.P. for Forfar, said that soon after the outbreak of war his assistance was invited by the Government in regard to the dye industry. He was appointed one of the Board of Trade representatives on the committee formed in the autumn of 1914 to inquire into the situation created by the stoppage of the import of dyes from Germany, the result of which was the formation of British Dyes, Ltd., of which he was appointed chairman. He devoted all his time with the object of trying to establish a national dye industry in Great Britain. The prospectus said that shareholders would have prior claim to the company's products. They began business in May, 1915, and in the same month Sir William Plender asked for their help in obtaining supplies of aniline oil for indigo-making purposes. Witness did all he could to help him, but there was great difficulty in getting the material necessary for making the oil, and at the end of 1915 Sir William was informed that they could give him no more help.

Mr. DOUGLAS HOGG, K.C.: Why was that?—Witness said they had to supply their shareholders, and about the end of 1915 it became apparent that there would be a very great additional demand for explosives from the Front. There was also a very serious difficulty in regard to supplies of sulphuric acid (which was one of the constituents of aniline oil), and his company spent £250,000 in providing a plant because they could not get sulphuric acid elsewhere. The committee of experts sat from day to day ascertaining what was needed and what was available. COUNSEL: Was there a drop of sulphuric acid to spare for anything except the national interests?—WITNESS: I have the highest authority for saying that there was not. Did the situation with regard to sulphuric acid become most serious in 1916?—Yes, it was very critical. It was the most anxious time during the war that I know.

Questioned about the correspondence with Sir William Plender concerning the supply of aniline oil, Mr. FALCONER said: "Throughout the letters we never breathed a word about the question of explosives. Nor was it mentioned at any of our meetings, nor in any way that would be likely to allow it to leak out that there was a scarcity of explosives." He was not now a director of British Dyes, Ltd., as he and five other directors resigned in 1918 because they did not agree with the policy of the Board of Trade. Mr. CLAUSON: What was the objection you felt to the policy?—WITNESS: We felt that the proper policy to pursue was to develop a national dye industry, the earning of profit and dividends being a secondary consideration. We realised the enormous strength of the great German undertaking which had been built up in the last 30 years, and that in order to compete with them we should have to get together an organisation equally well equipped. That would take time, and for that purpose we felt that dividends must, if necessary, be sacrificed. We wanted to make the building up of the organisation the first consideration, and the mere commercial result a secondary consideration. The view we took was that the Board of Trade's policy would inevitably lead to converting what was an organisation, mainly concerned with development, into one which would have more regard to making money than anything else.

Mr. JOHN HORRIDGE, of Bury, whose firm is a member of the Indigo Buying Amalgamation, said he always understood before the war that Meister, Lucius & Brunning, Ltd., were a British concern, and he thought the constitutional parts of synathetic indigo were made in England. When Levensteins took over the factory, his firm obtained considerable quantities of indigo.

Mr. R. POLLARD, manager of Thomas Welch & Co., Ltd., West Houghton, Lancs., formerly the executor of Thomas Welch, gave similar evidence.

Mr. LESLIE SCOTT, K.C., began the general legal argument on behalf of the controllers, and the hearing was again adjourned.

Lack of a domestic SUPPLY OF INTERMEDIATES and lack of technical skill in the commercial production of dye are handicapping the Japanese dyestuff industry.

From Week to Week

GERMAN DYES to the extent of nearly 90 tons were reported to be in stock at Kobe, Japan, last November.

DONATIONS TO CHARITIES from the employees of the United Turkey Red Co., Ltd., amounted to £181 last year.

Swansea PATENT FUEL WORKS have closed down, and further dismissals are being made at the Briton Ferry chemical works.

It is announced that Mr. J. L. BEHREND, of Behrend & Co., Ltd., has been appointed to a seat on the board of the British Oil & Cake Mills, Ltd.

A rumour is circulating on the Antwerp Bourse, says the *Nation Belge*, that a large firm DEALING IN OILS and gums has suspended payment.

It is announced that the SOUTH AFRICAN CARBIDE & BY-PRODUCTS CO., of Ballengeich, Inqaque, will commence operations in the near future.

Owing to the slump in the PRICE OF BY-PRODUCTS, the Gas Light & Coke Co. have announced an immediate advance from 4s. 8d. to 5s. 6d. per 1,000 cubic ft.

Dr. R. H. Pickard, F.R.S., Principal of the Battersea Polytechnic, has been appointed Director of Research to the British Leather Manufacturers' Research Association.

MR. P. R. ALLEN, O.B.E., A.M.I.C.E., who has retired from the Castner-Kellner Alkali Co., Ltd., after 26 years' service, is still being retained by the firm in a consultative capacity.

According to a Lloyd's report, received from Panama, a fire which was not extinguished for seven hours destroyed a portion of the NITRATE CARGO of the British steamer 'Azens.'

Steps are being taken by the board of the NITRATE PRODUCERS' ASSOCIATION with a view to securing an immediate curtailment of production.

During the month of October last year 143,837 TONS OF NITRATE passed through the Panama Canal for the Pacific Ocean.

EXPORTS OF RUBBER from the Federated Malay States during December last amounted to 6,090 tons, as against 10,340 tons in Decemebr, 1919.

Oil taken from the well at FORT NORMAN, in the Mackenzie River region, has been found to be lighter in petrol than the Southern Alberta oils, but much the same as regards content of illuminating oil.

The Board of Agriculture for Scotland advises farmers and others requiring ARTIFICIAL FERTILISERS, including superphosphates and compound manures, to make arrangements to secure early delivery.

A dinner "to celebrate the ADMISSION OF WOMEN TO THE CHEMICAL SOCIETY" will be held at the Lyceum Club under the auspices of its University Board on Monday next, at 8 p.m. Dr. Smedley Maclean will occupy the chair.

The announcement is made of a reduction in the PRICES OF FUEL OIL. Heavy fuel oil is now quoted £8 and Diesel oil £11 per ton, ex pipe-line or delivered by lighter, and £1 per ton more for delivery in bulk in England, Scotland or Wales.

At a recent meeting of the West of Scotland Iron & Steel Institute, attention was drawn to the advantages of LABORATORY RESEARCH in the manufacture of steel and the controlling of its qualities.

In EXPERIMENTS ON WHITE METALS for bearings, made at the American Bureau of Standards, it was found that tin-base alloys maintain their strength properties better at elevated temperatures than do those containing lead.

The North-Eastern and Hull & Barnsley Railways have recently PURCHASED A LARGE AREA OF LAND at Salt End, Hull, mainly to meet the demands for sites for oil storage, oil refineries and auxiliary works.

Under the auspices of the Science Section of Greenock Philosophical Society, an EXHIBITION OF SCIENTIFIC INSTRUMENTS AND APPARATUS was held in the M'Lean Museum on Monday night. Demonstrations were given during the evening.

SIR FREDERICK BLACK, president of the Institute of Petroleum Technologists, presided at a meeting of the Royal Colonial Institute on Tuesday, when Mr. George Howell gave an illustrated lecture on "Petroleum Resources of the British Empire."

At the Swansea Harbour Trustees' meeting last week an agreement was signed whereby the ANGLO-PERSIAN OIL CO. take further land at Swansea Docks. The company are completing works in Swansea and the neighbourhood which, it is understood, involve an expenditure of £7,000,000 sterling.

It was announced recently that the reward of £10,000 offered by the Commonwealth Government for the DISCOVERY OF PETROLEUM OIL in commercial quantities in Australia has been increased to £50,000. The reward will not apply to the operations of the Anglo-Persian Oil Co., which is under a contract with the Government to bore for oil in Papua.

At the examinations of the INSTITUTE OF CHEMISTRY held recently, Mr. K. A. Johnstone McClure (B.A., Cantab.), passed in general chemistry, and Mr. Cecil Chapman in chemical technology with special reference to coal tar and ammonia. Both candidates have been elected to the associateship of the Institute.

A general meeting of the MINING INSTITUTE OF SCOTLAND will be held in the Heriot Watt College, Chambers Street, Edinburgh, on Saturday, February 5, at 2.30 p.m. The fourth annual dinner of the Institute will be held the same day in the North British Station Hotel, Princes Street, Edinburgh, at 4.30 p.m.

Recognising the circumstances surrounding the industry and its inability to meet an increase of wages, the men's representatives at a joint meeting of the PATENT FUEL MANUFACTURERS' ASSOCIATION and the Dockers' Union at Cardiff on Monday waived their claim to the advance of wages they had asked for.

The New York correspondent of the *Times* states that SIR ROBERT HADFIELD has been awarded the John Fritz medal for notable scientific or industrial achievements. The award has been authorised unanimously by a committee representing the national societies of civil, mechanical, mining, metallurgical and electrical engineers.

A scheme for SCIENTIFIC AND INDUSTRIAL RESEARCH has been drawn up by the New Zealand National Efficiency Board, whose functions will be merged in the Central Board of Science and Industry, the establishment of which has been recommended by a special committee of the House of Representatives. It is proposed to allocate to the Central Board a sum of £5,000 for the first year, and £20,000 for each of four succeeding years.

The Secretary for Mines has re-appointed with extended terms of reference the Miners' Lamps Committee appointed by the Home Secretary in May, 1919. The Department is now responsible for SAFETY IN MINES. The members of the Committee are: Mr. W. Walker (Director of Health and Safety, Mines Department), chairman; Professor F. E. Armstrong, Mr. T. G. Davies (Inspector of Mines), Mr. H. Jenkins, Mr. G. A. Mitcheson, Mr. S. Roebuck, Mr. Jesse Wallwork and Professor R. V. Wheeler (Director of the Mines Department, Experimental Station, Eskmeals).

At a meeting of the Manchester section of the SOCIETY OF DYERS AND COLOURISTS last week, the chairman provisionally reported on the results of experiments which were being carried out at Manchester College of Technology relating to the lack of affinity evinced by oxycellulose to which uneven dyeing with direct cotton colours was in the main attributable. It had recently been found that such uneven dyeing was accompanied by actual destruction of colouring matter, and that under certain conditions such destruction might assume considerable proportions. Prolonged treatment with dilute caustic soda restored the affinity of such damaged material for these dye stuffs.

The British Lampblown Scientific Glassware Manufacturers' Association, Ltd., has arranged a series of LECTURES ON GLASS in connection with the lampblown glass industry. Professor W. E. S. Turner will deal with the manufacture and the properties of glass tubing and rods (three lectures); Mr. English will deliver three lectures on the manipulation of glass and the graduation of apparatus; Mr. Higgins will give three on thermometry and thermometer testing; Mr. Stott will deal with volumetric glassware (two lectures); and Mr. Davis will give the concluding lecture on technical points in the manufacture of bench-blown chemical glassware. The lectures, which commenced on January 5, will be delivered at the Northampton Polytechnic Institute.

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The thermodynamics of mixtures. M. B. Wagner. *Z. Phys. Chem.*, December 4, 1920, pp. 287-311.

ORGANIC HALIDES. On the splitting-off of halogens from certain organic compounds. A. H. Hedelius. *Z. Phys. Chem.*, December 4, 1920, pp. 343-366.

GASES. Apparatus for the simultaneous measurement of the pressure and volume of gases (tensi-eudiometer). G. F. Huttig. *Zanorg u allg. Chem.*, December 2, 1920, pp. 161-173.

CELLULOSE. On the action of dilute mineral acids on cellulose. A. Wohl and K. Blumrich. *Z. Angew. Chem.*, January 18, 1921, pp. 17-18.

Contributions to the analysis of the acid mixtures for cellulose nitrate production. E. Berl and W. von Bolten-stein. *Z. Angew. Chem.*, January 18, 1921., pp. 19-21.

CENTRIFUGES. The "ter Meer" design of centrifugal machine for separating solids from liquids. M. Kellner. *Z. Angew. Chem.*, January 11, 1921, pp. 9-15.

Miscellaneous

TIN. The precipitation of tin by iron. N. Bouman. *Rec. Trav. Chin. des Pays-Bas.* December 15, 1920, pp. 711-714.

EXPLOSION. The pressure limit for auto-oxidation considered as a particular case of the lower explosion limit. W. P. Jorissen., *Rec. Trav. Chim. des Pays-Bas.*, December 15, 1920, pp. 715-719.

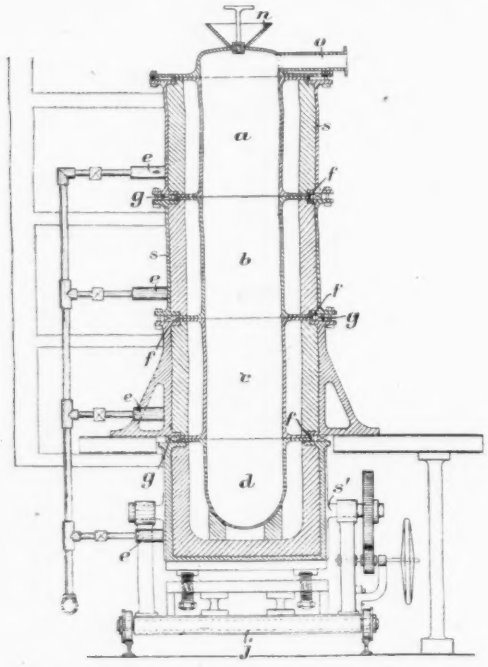
METALS. The crystallisation of metals by galvanic precipitation and certain associated phenomena. A. H. W. Aten and L. M. Boerlage. *Rec. Trav. Chim. des Pays-Bas*, December 15, 1920, pp. 720-735.

Patent Literature

Abstracts of Complete Specifications

155,600. METALLIC TUNGSTEN POWDER DIRECT FROM SODIUM AND POTASSIUM TUNGSTATES, PRODUCTION OF. C. J. Head, Laurence Pountney Hill, London. Application date. October 13, 1917.

The object is to obtain metallic tungsten powder in a fine granular state of high purity by reduction of the tungstates at a lower temperature, and in a much shorter time than usual. Sodium tungstate is ground and mixed with a chloride such as ammonium chloride, manganese chloride or any chloride of the iron and manganese group, and a reducing agent, and the mixture is heated to 1,000°C.-1,150°C. when tungstic oxide is produced and reduced to metallic tungsten powder. Ammonia is volatilised, and is recovered by absorption in hydrochloric acid. The temperature is below the reduction point of the oxides of manganese, &c., so that the reduced tungsten powder is free from admixture with reduced manganese or other metal.



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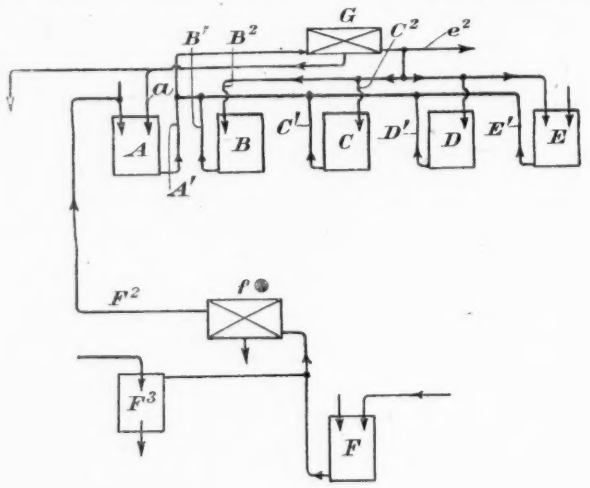
A suitable crucible furnace for the reduction of the tungstate is made up of four sections, *a*, *b*, *c*, *d*, of nickel chrome alloy contained in a cast-iron casing, *s*, lined with fire brick. The sections are provided with asbestos packing, *f*, and spring washers, *g*, to allow for expansion and contraction. Each section is heated by a tangential burner, *e*, the temperature increasing to a maximum in the lowest section, *d*. The crucible is charged through the hopper, *n*, and gradually heated to 950°C., when the charge melts and sinks into the section, *d*, while ammonia is driven off through the outlet, *o*. The section, *d*, is mounted on trunnions, s^1, and carried on a trolley, *j*, and after 3 to 5 hours the chamber, *d*, is disconnected and removed to another position where it is heated to 1,150°C., with exclusion of air for 15 hours. The tungsten powder is finally washed and ground.

155,609. PURIFICATION AND SEPARATION OF FILTRATION OF LIQUIDS OR LIQUORS, PROCESS FOR. J. N. A. Sauer, den Texstraat 2, Amsterdam, Holland. Application date, June 20, 1919.

The process is more particularly for the purification and filtration of sugar solutions by means of decolorising carbon. A series of treatment tanks, *A*, *B*, *C*, *D*, *E*, are each connected to a filter press, *G*, by outflow pipes, A^1, B^1, C^1, D^1, E^1, and inflow pipes, B^2, C^2, &c. The tanks, *A*, *B*, *C*, *D*, *E*, contain solutions of increasing purity, and fresh or regenerated decolorising carbon is supplied only to the tank, *E*, or filter, *G*. The solution in the tank, *E*, which is nearly pure, is passed through the filter press, *G*, to the discharge pipe, e^2, and the liquid in the tank, *D*, is then passed through the partly-used decolorising carbon in the filter, *G*, to the tank, *E*. This procedure is repeated with the liquid in the tanks, *C*, *B*, and the decolorising carbon in the filter, *G*, is then passed through the pipe, *a*, to the tank, *A*, and the mixture is returned to the



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filter, *G*, where the carbon is retained, and the liquid passes to the tank, *B*. The carbon is then removed for regeneration. If a preliminary treatment of the raw material is required it may be passed through the tank, *F*, containing decolorising carbon, kieselguhr, fuller's earth, charcoal, calcium carbonate or phosphate, sodium phosphate, calcium phosphite, &c., and the purifying material is removed in the filter, *f*, and regenerated separately while the liquid passes on through the pipe, F^2. Alternatively a decanting tank or a centrifugal separator, F^3, may be used.

155,611. FILTERING, DECOLORISING AND PURIFYING PROCESSES FOR LIQUIDS AND LIQUORS, JUICES, LIQUEFIED BODIES AND THE LIKE. J. N. A. Sauer, den Texstraat 2, Amsterdam. Application date, June 20, 1919.

The object is to purify liquids such as sugar solutions more rapidly and with a smaller amount of purifying material. It is found that when a small proportion of the purifying material is used, the material is spent and becomes unsuitable for a second purifying operation on a further quantity of similar liquid. It is now found that if the proportion of purifying material is increased beyond a certain critical percentage it is not exhausted, but may be used repeatedly for further purification of similar liquids, while the time required for purification is considerably reduced. The purifying material may be decolorising carbon such as "Norit" or "Eponit," or kieselguhr, fuller's earth, phosphates, carbonates, sulphates, or sulphites of lime.

155,679. GAS PRODUCERS. J. M. Wallwin, Saltisford Iron Works, Warwick. Application date, October 14, 1919.

A vertical suction gas producer is provided with a circular step fire grate composed of annular conical plates spaced vertically from one another. The central openings in the plates are of decreasing diameter from the upper to the lower plate. One or more of the plates may be provided with a movable sector which may be removed to provide a larger opening for the discharge of clinker. This grate facilitates the normal discharge of ashes.

155,692. SULPHUR, PURIFICATION OF. J. J. Hood, 4, Canonbury Park North, London, N. Application dates, October 25, and November 17, 1919.

An impure solution of sulphur in carbon bisulphide which is obtained from the spent oxide of gas works, is first agitated with strong sulphuric acid, when the tarry matter separates out. The solution is then agitated with about 5-10 per cent. by volume of water which effects a further purification. The sulphur solution is then filtered through bauxite or alumina as described in Specification 140,844, *see* THE CHEMICAL AGE, Vol. II., p. 509, and the solution may then be distilled to obtain the sulphur.

155,732. DESTRUCTIVE DISTILLATION OF OIL-BEARING MATERIAL *in situ*, HEATING MEANS FOR USE IN. D. Diver, 1648 Third Avenue, S.W., Calgary, Alberta, Canada. Application date, March 20, 1920.

A heater for distilling oil from oil-bearing substances in a well or bore hole comprises a hollow vertical cylinder of refractory material having a vertical diametral partition extending from the top nearly to the bottom. Fuel and air are admitted at the top of one of the passages thus formed and the hot gases pass downwards through that passage and then upwards through the adjacent passage to a vertical discharge flue connected at the top.

155,748. DI-ALKYL AMINO ETHYL DERIVATIVES OF THEOBROMINE, PREPARATION OF. Société Chimique des Usines du Rhône, Anociennement Gilliard, P. Monnet et Cartier, 89, Rue de Miromesnil, Paris. International Convention date (Germany), March 1, 1920.

The sodium salt of theobromine is treated with chloroethyl-dialkyl-amine in a neutral organic solvent such as benzene to obtain dialkyl-amino-ethyl-theobromine. This substance is soluble in most organic solvents, and in water, and has a strong alkaline reaction. The hydrochloride may be obtained by dissolving the base in the theoretical amount of hydrochloric acid, and evaporating to dryness. The aqueous solution is completely neutral. These compounds are used for therapeutic purposes.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention: 138,061 (D. A. Jaloustre, Z. Kheifetz and M. Warchabsky), relating to condensation products of phenols and aldehydes; *see* Vol. II., p. 362; 141,059 (C. Moureu and C. Dufraisse) relating to condensation products of acrolein and phenols, *see* Vol. II., p. 644; 147,535 (G. Kereszty and E. Wolf) relating to bleaching and disinfecting agents, *see* Vol. III., p. 429; 148,743 (Soc. Chimique des Usines du Rhône anciennement Gilliard, P. Monnet et Cartier) relating to normal butyl paramino benzoate, *see* Vol. III., p. 517.

International Specifications not yet Accepted

153,574. UREA. Nitrum Akt.-Ges., 30, Bahnhofstrasse, Zurich, and H. Schellenberg, Personico, Tessin, Switzerland. International Convention date, November 7, 1919.

Calcium cyanamide is mixed with a strong solution of calcium nitrate, and treated with nitric acid to obtain urea.

153,605. TERPINEOL. R. Marchand, 278, Valeriusstraat, Amsterdam. International Convention date, November 10, 1919.

Terpin hydrate is heated with quinoline sulphonic acid or other organic sulphonic acid, to obtain terpineol.

153,606. TERPIN HYDRATE. R. Marchand, 278, Valeriusstraat, Amsterdam. International Convention date, November 10, 1919.

Oil of turpentine or pinene is agitated for a long period with dilute sulphuric acid in an atmosphere of nitrogen or carbon dioxide, to obtain terpin hydrate.

153,877. CATALYTIC MATERIALS, CARRIERS FOR. Barrett Co., 17, Battery Place, New York. (Assignees of C. R. Downs, Cliffside, N.J., U.S.A.) International Convention date, November 13, 1919.

Oxidation reactions, such as the production of maleic acid from benzene, anthraquinone from anthracene, or phthalic acid from naphthalene, are effected by means of catalysts such as vanadium or molybdenum oxides. The catalytic material is deposited on aluminium in granular form with roughened surfaces, obtained by stirring the molten metal while cooling.

153,887. OILS AND FATS, PURIFYING. Soc. Rocca, Tassy, et de Roux, 46, Rue de Breteuil, Marseilles, France. International Convention date, November 13, 1919.

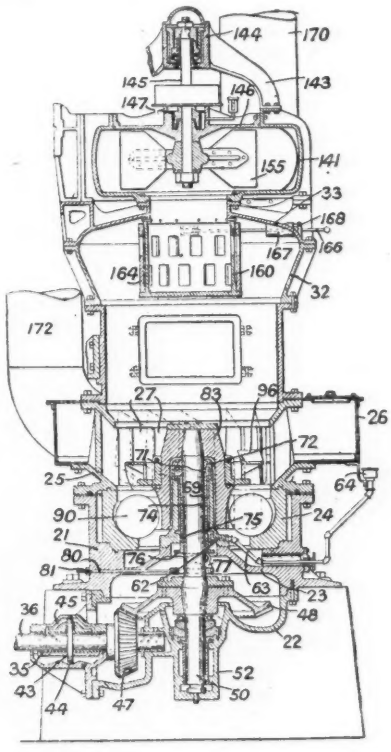
The oil or fat is dissolved in a volatile solvent, and treated with soda, lime, or other alkali or alkaline earth to remove free fatty acids.

153,890. INDIARUBBER, VULCANISING. Goodyear Tire & Rubber Co., 1,144, East Market Street, Akron, Ohio, U.S.A. (Assignees of W. Scott, 1,144, East Market Street, Akron, Ohio, U.S.A.) International Convention date, November 10, 1919.

The vulcanisation of indiarubber is accelerated by means of an aryl substituted thio urea containing one or more alkyl groups, one of which is in ortho position to the nitrogen of the thio urea. A mixture of indiarubber 50 parts, zinc oxide 45·5 parts, sulphur 3·5 parts and di-ortho-toluyl-thio-urea 1 part may be vulcanised in 10 minutes by steam at 40-lb. pressure. The thio urea is produced by treating ortho toluidine or other ortho alkyl substituted aromatic amine with carbon bisulphide.

153,889. GRINDING, CRUSHING, &C. Fuller-Lehigh Co., Fullerton, Pa., U.S.A. (Assignees of H. R. Collins, 47, South Fourth Street, Allentown, Pa., U.S.A.) International Convention date, November 8, 1919.

The grinding balls 90 of a pulverising mill are driven by radial arms carried by a yoke 83, which is mounted on the vertical shaft 50, driven by bevel gearing 47, 48. The pulverised



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material is lifted by inclined curved blades 96, which are also carried by the yoke 83, and is drawn upwards by an air current created by a fan 155 in the upper part of the casing. The current is regulated by a cylindrical damper formed by concentric perforated plates 160, 164, and the air is delivered through a conduit 170 to a separator in which it is caused to

travel in a helical path and thus deposit the solid material. The air is returned to the mill by a conduit 172, which opens into a spiral casing 26 just above the grinding zone. Tangential partitions 27 direct the air against the lifting blades 96.

153,917-8-9. TROPINE DERIVATIVES. Firm of E. Merck, 250, Frankfurterstrasse, Darmstadt, Germany, and O. Wolfes, 49, Hoffmannstrasse, Darmstadt, Germany. International Convention date, August 23, 1919.

153,917. Acetoacetic ester, methylamine, and succin dialdehyde in aqueous alkaline solution are cooled and condensed to obtain tropinone monocarboxylic ester, which may then be converted into ecgonine.

153,918. To obtain acetone dicarboxylic acid esters for use in preparing tropinone monocarboxylic esters, non-purified acetone dicarboxylic acid is first prepared according to Pechmann, *Annalen der Chemie*, 261, 1891, page 155, and then partly esterified.

153,919. The process described in 153,917 above is carried out with acetone dicarboxylic acid ester, methylamine, and succin dialdehyde.

LATEST NOTIFICATIONS

157,047. Manufacture of formic aldehyde or methyl alcohol or mixtures thereof. Dreyfus, H. March 22, 1917.

157,048. Manufacture of alcohol. Dreyfus, H. March 22, 1917.

157,050. Vulcanising rubber. Soc. Ricard, Allenet et Cie. January 15, 1920.

157,054. Method of producing alloys with metals of the ferro-chromium groups and silicum or its compounds. Walter, R. January 14, 1920.

156,698. Synthesis of ammonia from its elements and catalyst therefor. Nitrogen Corporation. January 7, 1920.

156,713. Manufacture of perborates and di-sodium-perphosates. Aschkenasi. November 27, 1918.

156,725. Process for the manufacture of colloidally soluble substances and of suspensions or emulsions. Lilienfeld, L. August 1, 1919.

156,740. Manufacture of phenol condensation products. Chemische Fabriken Worms Akt. Ges. September 9, 1918.

156,752. Process for the production of plastic bodies of cellulose ethers. Leysieffer, G. January 10, 1920.

156,755. Process and apparatus for the manufacture of fatty acids of high smelting points starting from butyl alcohol. Soc. Francaise des Destilleries de l'Indo-Chine. October 13, 1919.

156,797. Method of removing solid nitrogen oxides from refrigeration devices. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. September 17, 1914.

156,798. Apparatus for effecting continuous crystallisation of solution. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. September 17, 1914.

156,799. Manufacture of concentrated nitrous gases. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. October 6, 1915.

156,800. Process of converting nitrous gases into concentrated nitric acids. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. May 22, 1915.

157,220. Process of spinning nitrocellulose solution. Fabrique De Soie Artificielle De Turbize. December 28, 1917.

157,226. Manufacture of a complex aurothiosalicylic acid. Fabwerke vorm Meister, Lucius, and Bruning. October 13, 1915.

157,280. Process for the destruction of micro-organisms in liquids. Candy Filter Co., Ltd. January 8, 1920.

157,281. Method of and apparatus for the manufacture of sulphuric acid. Helbronner, A. & Pipereant, P. April 29, 1918.

Specifications Accepted, with Date of Application

126,625-7. Zinc sulphide, process for the manufacture of anhydrons. P. Desachy. October 19, 1917.

127590. Horizontal coking ovens. Soc. Franco-Belge de Fours à Coke. May 29, 1918.

132,798. Precipitate rich in albumen and poor in ash, from the raw juices and waste liquors of sugar factories. Process of manufacture of. M. von Wierusz-Kowalski. July 11, 1916.

136,831. Rotary pulveriser. Soc. Milanese Impianti Industriali C. Crespi-Squassi. December 17, 1918.

139,219. Crushing and pulverising machines. J. E. Kennedy. February 2, 1914.

144,710. Electro-osmotic separation of substances. Elektro-Osmose Akt.-Ges. (Graf Schwerin Ges.) April 8, 1918.

145,511. Cellulose acetates, manufacture and production of solutions of. Badische Anilin and Soda-Fabrik. February 9, 1914.

147,099. Crude gas liquor, method of treating—to obtain ammonia solution. C. Still (Firm of). December 6, 1915.

152,975. Hydrogen and mixtures of hydrogen and nitrogen, processes for the production of. C. Toniolo, and Officine Elettro-chimiche Dottor Rossi. October 21, 1919.

155,864. Gases from liquids, Process for the removal of. W. S. Elliott. July 17, 1919.

155,859. Gas washer and purifier. G. Coune. April 30, 1919.

155863. Fat, wax, oil, gelatine, and the like, Process and apparatus for the extraction of—from materials containing the same. E. Scott & Co., Ltd., and J. Macgregor. July 7, 1919.

155,866. Soap powders having a high percentage of liquid fats and oils, Process for producing. W. J. Mellersh-Jackson. (*Nordiske Fabriker De-No-Fa Aktieselskap*). July 25, 1919.

156,269. Caustic soda or caustic potash, method of conducting fusions with molten. B. D. Steele and R. B. Robertson. February 9, 1918.

156,270. Filtering-apparatus. W. Paterson. March 2, 1918.

156,284. Oils, treatment of heavy. A. E. Dunstan and F. F. Thole. July 8, 1919.

156,324. Vertical gas retorts and the like, machines for charging. Goodall, Clayton & Co., Ltd., C. R. Payne and J. A. Archdale. October 6, 1919.

156,328. Sulphuric acid, manufacture of. South Metropolitan Gas Co., and P. Parrish. October 6, 1919.

156,329. Para-cymene, manufacture of. British and Foreign Chemical Producers, Ltd. (Rheinische Kampfer-Fabrik-Ges.). October 6, 1919. Addition to 142,738.

156,396. Shale, method of treating—and recovering oil therefrom. W. W. Hoover and T. E. Brown. December 10, 1919.

156,447. Refractory materials for furnace linings, manufacture of. A. Nollason. April 21, 1920.

Applications for Patents

American Coke & Chemical Co. Reflex coke oven, and method of preheating or conserving waste heat. January 10. (United States, June 22, 1916.) 1552.

Ashcroft, E. A. Metallurgy of lead and zinc and their sulphides. January 14. 2068.

Bader, W. British Cellulose & Chemical Manufacturing Co., Ltd. Manufacture of pyrosulphates. 2693. January 20.

Brat, P. Recovering nitrogen in the form of ammonia from peat. January 10. (Germany, October 21, 1918.) 1447.

,, Recovering ammonia from peat. January 10. (Germany, July 20, 1918.) 1448.

Bräunig, K. Production of glyoxal. January 10. (Germany, June 29, 1916.) 1241.

Campbell, F. H. Manufacture of starch. January 11. 1800.

Candy Filter Co., Ltd. Destruction of micro-organisms in liquids. January 10. (Austria, January 8, 1920.) 1190.

Chadbourne, F. G. Manufacture of soap. January 10. 1460.

Chemische Fabriken Worms Akt.-Ges. Distillation. January 10. (Germany, August 6, 1917.) 1575.

Chemische Fabriken und Asphaltwerke Akt.-Ges. Manufacture of tanning-agents, and process for tanning therewith. January 10. (Germany, June 21, 1916.) 1583.

,, Manufacture of tanning-stuffs, and process of tanning therewith. January 10. (Germany, July 17, 1916.) 1584.

Clerc, C. Manufacture of zinc white. January 10. (France, November 15, 1919.) 1588.

Conover, C., John, K. B., and Ruth, C. E. Purification of naphthalene. 2554. January 19.

Corsalli, W. Enriching iron alloys poor in silicon and manganese. January 10. (Germany, June 27, 1917.) 1655.

,, Enriching iron alloys poor in silicon and manganese. January 10. (Germany, July 27, 1917.) 1658.

Davies, A. H. Production of colouring-matters of the anthraquinone series. January 13. 1991.

Delarozière, F. F. Manufacture of sodium and potassium ferrocyanide. 2224. January 17.

Deutsche-Luxemburgische Bergwerks-und Hütten-Akt.-Ges. and Helpert, S. Treatment of waste sulphuric acids. January 10. (Germany, May 12, 1916.) 1415.

Diepschlag, E. Process for regulating working of waste gases in blast-furnace operations. January 11. (Germany, June 30, 1920.) 1757.

Dingler'sche Maschinenfabrik Akt.-Ges. Purifying gases and vapours. January 10. (Germany, September 1, 1913.) 1532.

Du Pont de Nemours & Co., E.I. Methods of removing odours from treated oils. January 10. (United States, June 13, 1918.) 1322.

Farbwerke vorm. Meister, Lucius, & Brüning. Manufacture of complex aurothiophenols. January 10. (Germany, April 22, 1916.) 1579.

,, Manufacture of phlorobutyrophenone, phloroisobutyro-phenone and their homologues. January 10. (Germany, November 3 1917.) 1580.

Faure, E. Production of motive power from the inertia of liquid and gases. January 10. (France, October 12, 1916.) 1652.

Foster, J. Method of producing lime for building together with ammonia and a gas for power purposes. January 11. 1690.

Haakh, H. Manufacture of oxyarylaldehydes. January 10. (Germany, February 6, 1918.) 1576.

Haber, E. Device for propelling liquids or gases by centrifugal blowers. January 10. (Germany, February 7, 1917.) 1380.
Helbronner, A. and Piperaut, P. Manufacture of sulphuric acid. January 10. (France, April 29, 1918.) 1191.
Hendon Paper Works Co., Ltd. Substitute for celluloid. January 14. 2109.
Hernu, H. Apparatus for purifying and treating gases. January 10. (France, December 9, 1918.) 1198.
Hodge, J. and Ovens & Sons, Ltd., T. Sulphuric acid valves. January 13. 1946.
Illing, V. C., and Kelly, J. Production of asphalt from petroleum, &c. 2833. January 21.
Kämpf, A. Apparatus for reducing alkali cellulose, &c. January 12. (Germany, January 13, 1920.) 1832.
Kestner, P., Metallic media for fixation of oxygen of water in apparatus for abstracting gases from liquids. Jan. 17. (France, June 9, 1920.)
Kestner, P. Abstracting gases from water by metallic filters. January 10. (France, July 22, 1920.) 1400.
Koller, G. R. Manufacture of synthetic resins. January 14. 2065.
Lidholm, J. H. Method of producing cyanamide from calcium cyanamide. 2411. January 18. (Sweden, March 3, 1920.)
Loke, J. J. Manufacture of ferrous titanium or refined iron or steel directly from fundamental material or oxidised titanic iron. January 10. (Holland, March —, 1919.) 1404.
Lunden, H. L. R. Production of nitrogen compounds by absorption of nitrogen in a mixture of reaction. 2589. January 19.
Lunden, H. L. R., Preparation of a mixture of compounds of alkaline earth metals and carbon for absorption of nitrogen. 2914. January 22.
Margreth, J. Carbide receptacle for acetylene-gas generators. January 10. (Switzerland, August 11, 1915.) 1351.
Mather, P. Fractional distillation of crude oil, &c. January 11. 1785.
Mauthner, N. Processes for making halogen derivatives from hydrocarbons. January 10. (Hungary, November 20, 1918.) 1146.
Morgan, G. T. Production of aromatic aldehydes. 2480. January 19.
New Jersey Zinc Co. Manufacture of French oxide. January 14. (United States, March 31, 1920.) 2104.
Oelwerke Stern-Sonneborn Akt.-Ges. Apparatus for testing lubricants and bearings. January 10. (Germany, March 10, 1919.) 1234.
Parrish, P. Treatment of waste liquor from wet extraction of copper. January 11. 1790.
Pfeifer, I. Processes for making halogen derivatives from hydrocarbons. January 10. (Hungary, November 20, 1918.) 1146.
Plauson, H. Refining oils or fats. 689. January 7.
Pollacsek, E. Manufacture of mastic or binding substance from sulphite lye. January 10. (Austria, October 17, 1919.) 1608.
Polysius, G. (Firm of). Low-temperature carbonisation. January 10. (Germany, February 1, 1918.) 1230.
Raschig, F. Recovery of benzol hydrocarbons from coke-oven gas. January 10. (Germany, November 13, 1913.) 1509.
Rippl, F. Continuous distillation or gasification of organic matter. January 10. (Germany, August 25, 1915.) 1528.
Rupe, H. Manufacture of camphylcarbinol. 1101. January 8. (Germany, June 2, 1916.)
Salerni, P. M. Apparatus for distillation of carbonaceous materials. 234. January 4.
Schütz, H. C. Removing carbon from iron, &c. 472. January 5. (Germany, January 11, 1918.)
Scottish Dyes, Ltd. Production of colouring matters of the anthraquinone series. January 13. 1991.
Soc. Francaise des Distilleries de l'Indo-Chine. Manufacture of fatty acids of high melting-points starting from butyl alcohol. 822. January 7. (France, October 13, 1919.)
South Metropolitan Gas Co. Treatment of waste liquor from wet extraction of copper. January 11. 1790.
Stein, L. Process for utilising concentrated waste sulphite liquor. 470. January 5. (Germany, September 18, 1919.)
Still, C. Saturators for producing solid salts by treatment of gases with liquid. 1097. January 8. (Germany, August 8, 1919.)
Volmer M. Production of copper coatings on non-metallic materials. January 10. (Germany, November 12, 1919.) 1300.
Wade, H. (*Deutsche Gold-und Silber-Scheideanstalt vorm Rossler*). Manufacture of acetone. 518. January 6.
,, Manufacture of acetaldehyde. 519. 520. January 6.
,, Manufacture of acetic acid. 521. January 6.
Waentig, H. P. Process for obtaining cellulose. January 10. 1562.
Wallin, E. Production of steinholz from magnesia and magnesium salts. January 10. (Germany, March 12, 1914.) 1687.
Wohl, A. Oxidation of hydrocarbons into carbonyl compounds or acids. 257. January 4. (Germany, June 22, 1916.)
,, Catalytic oxidation of organic compounds. 258. January 4. (Germany, December 18, 1916.)

Licences of Right

OFFICIAL announcement is made that applications have been received for the following patents to be indorsed "Licences of Right":—1134/1911 and 14,612/1911 (S. E. Sieurin) relating to the reduction of ore.

The following Patents have now been indorsed "Licenses of Right":—9051/1915 (Chemische Fabrik Brugg Akt.-Ges.), relating to chemically drying centrifuged ammonium bicarbonate; 15,749/1915 (O. Imray) (Society of Chemical Industry in Basle), relating to the manufacture of products containing sodium pyrophosphate and active oxygen; 121,725 (A. Pictet), relating to the manufacture of levoglucosan.

Manufacture of Glue in Australia

ALTHOUGH the manufacture of glue in Australia dates back a number of years, the production of gelatine until quite recently was unimportant. In 1913 the total amount of glue and gelatine imported into and produced within the Commonwealth amounted to, approximately, 1,500 tons. The uses of glue are now practically defined, but fresh avenues of usefulness for gelatine are being discovered every day. To-day there is no scarcity of gelatine for all requirements in Australia, and a large export trade is looked for in the near future. Owing to the suitable climate and the fact that the raw materials produced locally can be handled fresh, Australian factories can produce the highest grades of glue and gelatine. Being a Continent largely devoted to the rearing of cattle and sheep as well as possessing a plague of rabbits, the supply of raw material —waste products from the freezing works, tanneries and similar institutions—is very plentiful, and, what is equally important, very fresh. One very large factory has recently been established at Botany, near Sydney, and is now in full working order. The factory is fitted with every modern requirement, and it is the aim of the proprietors to turn out only the best products.

Kauri Oil in New Zealand

THE first plant in New Zealand for the extraction of oil from kauri-gum peat, or "pukau" (which is part of the soil of the buried kauri forest saturated with the oil of the kauri), commenced operations at Redhill (North Auckland) last December. According to a report by the U.S. Vice-Consul at Auckland, the plant is built to turn out 4,500 gallons of oil per week, its fractions being motor spirit, a valuable solvent oil, a turpentine substitute, and paint and varnish oils. The process of extracting the oil is very similar to distilling oil from shale. The cost of distillation is about the same, but the digging of the pukau from the swamp is infinitely cheaper than working a shale deposit, as pukau generally runs in layers 4 ft. thick, having only 1 ft. of over-earth. At present pukau is sieved by hand; the small pieces of gum (known as nuts, chips, and seed gum) are saved and oil is extracted from the residue. A new machine is being installed for sieving the pukau and washing the gum, thus saving a great amount of labour. This will be a subsidiary branch of the oil works. In the swamps large quantities of oil-soaked timber are found, which later will likewise be treated for oil. It is claimed that the bark, limbs, and roots of the kauri tree are capable of yielding 110 gallons per ton, richer than the pukau itself, and it is estimated that the best swamps carry 500 tons of this oil-soaked timber.

The supporters of this Redhill plant claim that the extracting of oil from pukau will become the most important industry in New Zealand, since there are thousands of acres of this swamp land in the North Auckland Province, and each acre cont ins a large quantity of oil.

The Chelmsford Corporation have carried out important alterations to their SULPHATE OF AMMONIA WORKS in connection with the gas undertaking.

COUNCILLOR WILLIAM HARDMAN, of Norwich House, Lytham Road, Blackpool, who died suddenly on January 22, was a member of the firm of Hardman & Holden, chemical manufacturers, Miles Platting, Manchester. He had been a member of the Blackpool Town Council since 1903, and in October last had accepted an invitation to become Mayor, but had to withdraw for health reasons.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative, The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, January 27, 1921.

The tendency towards improved conditions which we have indicated lately makes slow progress, but it must be described rather as a spirit of hopefulness than as any appreciable increase in the volume of actual business transacted. Whilst the business is obscure, the opinion is expressed in influential quarters that we have passed the worst of the crisis.

There has been small business passing for export, and with the continued improvement in the Continental exchanges one may hope for better things from that direction.

General Chemicals

ACETONE is in steady demand and unchanged in price.

ACID ACETIC.—The demand has shown a steady improvement during the last week and stocks are decidedly lighter.

ACID CARBOLIC is again easier in price with nothing doing.

ACID FORMIC is little enquired for and the position is easy.

ACID OXALIC is slightly lower in price on Continental offering, but the quantities available are not thought to be large.

ACID TARTARIC remains a slow market. Price nominally unchanged.

BLEACHING POWDER is still offered from the Continent, but there is little doing.

COPPER SULPHATE is still enquired for, and it is hoped that the improved exchange position will facilitate business.

FORMALDEHYDE.—Only small quantities are available for early delivery and stocks are firmly held.

LEAD ACETATE is rather more interesting than of late and the present very low prices may prove to be transitory.

LITHOPONE is quietly steady with a moderate business passing.

MAGNESIUM SALTS remain slow of sale and uninteresting.

POTASSIUM CARBONATE.—Nothing of interest is reported and stocks are difficult to realise.

POTASSIUM CAUSTIC.—The demand is purely nominal and prices still incline downward.

POTASSIUM PRUSSIATE.—Spot supplies are small and little business is passing, for forward delivery. Market unchanged.

SALAMMONIAC.—The reduction in price does not seem to have stimulated business to any extent, and lower prices are not improbable.

SODIUM ACETATE.—The better demand is maintained and the price is decidedly firmer.

SODA BICHROMATE.—We have not heard so much of second-hand offerings, but little improvement in the price is visible yet.

SODA CAUSTIC is still offered in second-hands and exhibits a weak tendency.

SODA HYPOSULPHITE.—No important business is reported. Price unchanged.

SODA NITRITE is offered cheaply by second-hands and demand is almost nominal.

SODA PRUSSIATE is again lower in price. English makers have notified a further reduction.

Coal Tar Intermediates

There is again very little to report, business remaining extremely quiet. The tone, however, is fairly good, and prices are in the main without change.

ALPHA NAPHTHOL.—Some small business has been transacted on makers' current prices.

ANILINE OIL AND SALT.—Prices are unchanged, but little business is passing.

BETA NAPHTHOL is steadier and buyers seem inclined to take more interest in this product.

DINITROPHENOL is rather neglected, but the price is nominally without change.

NITRO BENZOL is only moderately active, but price is maintained.

PARANITRANILINE is quietly steady with little business to report.

PARAPHENYLENE DIAMINE is in better demand and price is maintained.

RESORCIN is inclined to sag, and very little business is passing.

SALICYLIC ACID continues stagnant and in buyers' favour.

Coal Tar Products

There is little change in the market since last week.

90 PER CENT. BENZOL.—The price for this article remains more or less stationary at 2s. 7d. to 2s. 9d. on rails in the North and 2s. 6d. to 3s. in the South.

PURE BENZOL is inactive and is quoted from 2s. 10d. to 3s. on rails.

CREOSOTE OIL is fairly steady at about 1s. per gallon in the North and 1s. 1d. to 1s. 2d. in the South.

CRESYLIC ACID shows no improvement, Dark 95/97 per cent. being worth 2s. 9d. to 3s., and Pale 97/99 per cent. 3s. 6d. to 3s. 9d.

SOLVENT NAPHTHA is quoted 2s. 6d.

HEAVY NAPHTHA.—The price is about 3s. 3d.

NAPHTHALENE is weak at about £9 to £15 per ton for the Crude qualities, while Refined is worth from £24 to £26 per ton.

PITCH.—There is no change to report in the position.

Sulphate of Ammonia

The position for this article is the same as last week.

Current Prices

Chemicals

	per	£	s	d.		£	s	d.
Acetic anhydride	lb.	0	2	6	to	0	2	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	110	0	0	to	115	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	56	0	0	to	57	10	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	72	10	0	to	74	0	0
Carbolic, cryst. 39-40%	lb.	0	0	9½	to	0	0	10
Citric	lb.	0	2	5	to	0	2	8
Formic, 80%	ton	85	0	0	to	90	0	0
Gallic, pure	lb.		5	6	to	0	5	9
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	42	10	0	to	42	10	0
Lactic, 60 vol.	ton	47	10	0	to	50	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	1	1	to	0	1	2
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	10	9	to	0	11	0
Salicylic, Technical	lb.	0	1	6	to	0	1	8
Salicylic, B.P.	lb.	0	1	9	to	0	2	0
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	2	0	to	0	2	1
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	13	0	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	15	5	0	to	16	0	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	6	to	—		
Ammonia, chloride	ton	85	0	0	to	90	0	0
Ammonia, muriate (galvanisers)	ton	57	10	0	to	60	0	0

	per	£	s.	d.		£	s.	d.
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	77	10	0	to	80	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	21	0	0	to	23	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	8
Bleaching powder, 35-37%	ton	22	0	0	to	23	0	0
Borax crystals	ton	39	0	0	to	41	0	0
Calcium acetate, Brown	ton	15	0	0	to	17	0	0
,, Grey	ton	23	0	0	to	25	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	1	0	0	to	1	0	6
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	39	0	0	to	40	0	0
Cream Tartar, 98-100%	ton	200	0	0	to	210	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	130	0	0	to	135	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	58	0	0	to	65	0	0
Carbonate (White Lead)	ton	53	0	0	to	50	0	0
Nitrate	ton	62	10	0	to	65	0	0
Litharge	ton	53	0	0	to	55	0	0
Lithopone, 30%	ton	37	10	0	to	40	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to		—	
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	1	3	to	0	1	4
Carbonate, 90%	ton	85	0	0	to	90	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	290	0	0	to	205	0	0
Nitrate, refined	ton	63	0	0	to	65	0	0
Permanganate	lb.	0	2	6	to	0	2	9
Prussiate, red	lb.	0	3	0	to	0	3	3
Prussiate, yellow	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	0	0	to		—	
Seconds	cwt.	4	15	0	to		—	
Sodium acetate	ton	45	0	0	to	47	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	9½	to	0	0	10
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	27	0	0	to	28	0	0
Caustic, 76%	ton	28	0	0	to	29	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	26	0	0	to	27	0	0
Nitrite, 96-98%	ton	60	0	0	to	62	0	0
Phosphate, crystal	ton	32	0	0	to	35	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	22	0	0	to	25	0	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	6	to	0	2	9

	per	£	s.	d.		£	s.	d.
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	9	to	0	6	0
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	2	6	to	0	2	9
Benzoate of soda	lb.	0	2	3	to	0	2	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	9	6	to	0	10	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	10	0	to	0	10	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthaline	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	6	6	to	0	7	0
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	3	to	0	8	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
Resorcin, technical	lb.	0	7	6	to	0	8	6
Resorcin, pure	lb.	0	10	0	to	0	11	6
Salol	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Alsatian Potash

THERE is now some indication of improvement in the potash trade, and buyers are making more frequent enquiries for Alsatian supplies. During the past week prices have remained steady at about £6 5s. for French Kainit 14 per cent., and £8 10s. for French Manure Salts, 20 per cent. f.o.r.

Salt Discovery in Athabasca

IT is reported that the existence of an extensive field of high grade salt at Fort McMurray has been definitely established by drillers operating under the direction of the Provincial Government, the well having been sunk through 30 ft. of pure salt at a depth of 650 ft. The exploration well at McMurray was commenced about twelve months ago, and the strike bears out the opinion of geologists that an immense field of salt exists along the Athabasca River, in the McMurray region.

Company News

Reports and Dividends

GAS LIGHT AND COKE.—The directors recommend dividends for the half-year to December 31 last at the rate of £2 12s. 6d. per cent. per annum on the 3½ per cent. maximum stock, and at the rate of 3 per cent. per annum on the ordinary stock, carrying forward £326,597.

BRITISH OIL & CAKE MILLS.—Balance dividend of 5 per cent., less tax, on ordinary shares, which, with the interim dividend paid in September last, makes a total of 15 per cent., less tax, for the past year on the increased capital. For the previous year 25 per cent., less tax, was paid. The directors state that it is hoped that the accounts will be in the hands of the shareholders about the end of March.

ESCOT RUBBER ESTATES.—In order to preserve the continuity of the company's records, accounts have been issued for the six months ended September 30, 1920. These show a profit of £460, after writing off £368 for depreciation. Including the amount of surplus profits handed over by the liquidator, the available balance is £5,038. A dividend of 3 per cent. is proposed, which will leave £1,790 to carry forward.

Company Meeting

BRITISH GLASS INDUSTRIES.—Presiding at a special general meeting of the shareholders of British Glass Industries, Ltd., on January 21, Mr. George E. Alexander referred to the recent change in the Constitution of the board of directors, which now consisted of Sir Franc's Tawle, Messrs. Pater Haig-Thomas, G.E. Alexander, J. S. Cannington, and G. Gilbey.

With regard to the financial obligation of the Company there was due by the Company to its bankers a sum of (approximately) £372,000; a sum of £100,000 was due on constructional work at the Canning Town plant, and there was due as a loan account a sum of £158,000 to two of the former directors as well as other minor outstanding liabilities for which further finance would be required.

Arrangements had been made for an issue of debentures coming behind the debt due to the bank. Mr. Alexander stated that applications have been made or promised from some of the largest shareholders amounting to over £260,000, which would be sufficient to complete their constructional programme at Canning Town and to repay the loan of £158,000.

Dealing with the position of the United Glass Bottle Manufacturers, which Mr. Alexander said the Company had advanced to British Glass Industries, Ltd., a sum of approximately £70,000 on account of dividends up to June 30. last. The accounts of the United Glass Bottle Manufacturers, Ltd., showed a half-yearly gross profit for the six months of £187,000. After providing for interest on debentures, depreciation of plant, redemption of leaseholds, and after charging income-tax, but without any provision for excess profits duty and corporation profits tax, or directors' and management percentages, confirming the statement made at the last meeting that these gross profits exceeded a return of 20 per cent. on the purchase price of the shares. The directors of the United Glass Bottle Manufacturers, Ltd., had no reason to doubt that the profits up to December 3 last were approximately at the rate of the same high level. The board desired to emphasise the fact that capital to complete the Charlton Works and further working capital would be required.

Notices

STOCK EXCHANGE ANNOUNCEMENT.—Dealings in the following securities have been specially allowed by the committee under Temporary Regulation 4 (3) (these securities will rank pari passu with those in which special settling days have already been appointed as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted):

Emerald Rubber and Cocoanut Co., Ltd.—39,279 shares of £1 each, fully paid, Nos. 94,501 to 133,779, and 33,445 new shares of £1 each, fully paid, Nos. 133,780 to 167,224.

Nobel Industries, Ltd.—6,811 ordinary shares of £1 each, fully paid, Nos. 7,441,637 to 7,448,007 and 7,580,517 to 7,580,986; 1,126 Deferred shares of £1 each, fully paid, Nos. 1,441,944 to 1,443,069; and 5,119 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 5,957,525 to 5,961,970 and 6,230,028 to 6,230,700.

Phœnix Oil and Transport Co., Ltd.—32,536 shares of £1 each, fully paid, Nos. 1,080,996 to 1,113,531.

ALBY UNITED CARBIDE FACTORIES.—A circular issued to the shareholders of Alby United Carbide Factories Ltd., says:

A committee was appointed at the annual general meeting of the shareholders on July 30, 1920, to confer with the board upon the position of the company, and to advise as to the best means to be adopted to promote its successful working in future. Following their appointment the committee devoted much time to the consideration of the position of the company, and on various occasions conferred with members of the board.

The committee made certain recommendations to the board with a view to strengthening the directorate and the executive. The British members of the board have since placed their resignations in the hands of the chairman, and after consultation with the committee the board has been reconstituted as follows: Colonel H. Le Roy-Lewis, C.B., C.M.G., D.S.O, (chairman), Lord Southborough, G.C.B., G.C.M.G., G.C.V.O.. Colonel O. C. Armstrong, D.S.O., Sir James Farquharson Remnant, Bart., M.P., Mr. L. A. Stride (secretary of the Shareholders' Advisory Committee), Mr. H. C. P. Woolmer, A.M.Inst.C.E., M.Inst.M. and M. (who has been appointed managing director), with Advocat H. M. Helliesen and Mr. Jorgen Faye, directors in Norway.

The committee regard the position of the company as difficult, a large part of the capital being locked up in what are, for the present, unproductive assets. The seasonal nature of the trade, heavy cost of manufacture, and restricted markets, call for the employment of large sums in stocks of raw materials and manufactured products, and necessitate the provision of further working capital.

The board have been able to arrange a temporary loan to meet the company's immediate requirements, and as soon as Mr. Woolmer has had an opportunity of studying the position in Norway, as well as in London, and on receipt of the figures for the year ended December 31 1920, or possibly at an earlier date, the board hope to discuss with the committee proposals for simplifying the accounts and placing the finances of the company on a better footing. When a plan has been formulated, and fully discussed, it will be submitted to the shareholders in general meeting for their approval.

It is also stated that the members of the new board will ask for the ratification of their appointment from the shareholders of the company at a general meeting, which will be held at the earliest opportunity possible.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

ANDREWARTHA & CO., LTD., 31, Old Town Street Plymouth. Dealers in glass, oil, colour, white lead and varnishes. Nominal capital, £6,000 in 6,000 shares of £1 each. Directors: R. Andrewartha, C. H. Andrewartha (permanent managing directors).

CORKE, T. R., & CO., LTD. Manufacturers and dealers in oils, lubricating grease, &c. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors: P. Dannatt (chairman), P. D. Dannatt, T. R. Corke. Qualification of directors, £10.

CROWN PERFUMERY CO., LTD., Sidney Road, Homeron, N.E. Soapmakers, perfumers and candle makers. Nominal capital, £100,000 in 100,000 shares of £1 each. Directors to be appointed by subscribers.

HAMPTON SELWYN & CO., LTD. Merchants and dealers in fertilizers and artificial manures, &c. Nominal capital, £3,000 in 1,000 preference shares, and 2,000 ordinary shares of £1 each. Qualification of directors, £50. Subs.: C. L. Guttridge, Florence M. Miles.

JOHN THOMPSON (WHOLESALE DRUGGISTS, 1921), LTD. Chemists, druggists, drysalters. Nominal capital, £35,000 in 35,000 shares of £1 each. Directors: J. A. Cunningham, W. O. Smith, A. E. Williamson, N. A. Wood, T. Yule, W. Yule. Qualification of directors: 500 shares. Remuneration of directors, £1,000 to be divided.

LEEDS PHOSPHATE WORKS, LTD. Agricultural chemists Nominal capital, £50,000 in 50,000 shares of £1 each. Directors: W. S. Vaughan, J. T. Middleton, G. Linklater. Remuneration of directors, £500 to be divided.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
United Kingdom	Asbestos	77
British India	Glassware ; soap	83
Toronto.....	Druggists' sundries	85
Trinidad	Glassware	96
Christiania ...	Palm oil	111
Brussels ...	Industrial and pharmaceutical chemical products.	—
Egypt ...	Oil	—
Switzerland ...	Colours ; lithopone ; zinc white ; lead white ; resins ; oils.	—
Budapest ...	Heavy chemicals ; soap indigo ; crude drugs ; soap ; oils.	—
Toronto	Oils	—
Vancouver	Fertilisers ; dyes ; chemicals ; oils ; glues ; dry colours ; oxides	—
Flemalle Haute	Engineering Supplies ; metallurgical products	—

Tariff Changes

Australia.—The importation of carbide of calcium is prohibited, except under licence from the Minister for Trade and Customs.

Egypt.—Dyes and dyestuffs may be exported from Egypt.

France and Algeria.—Increased Customs duties providing for increased "coefficients," were published in the *Journal Officiel* on January 13 and 14. The following chemicals are included: Oxides of lead; oxide of zinc lithopone; distilled glycerine; nitro-benzine, crude nitrotoluene, mononitronaphthalines, sulphonic derivatives of benzine, of toluene, of xylene, of naphthaline and their salts; dinitrobenzine, pure orthonitrotoluene, dinitrotoluene, trinitrotoluene, dinitronaphthalene, nitronapthalenic and sulphonic acids and their salts; nonochlorobenzine, dichlorobenzine para and ortho, chloronitrobenzine, chlorodinitrobenzine; chloride of benzyl; chloride of benzylidine; paranitrotoluene, orthosulphonic paranitrotoluene, disulphonic dinitrotoluene, and their salts; dinitroxylene-sulphonate of sodium, trinitrochlorobenzol; trichloride of benzyl; parabromonitrobenzol; cyanide of benzyl; pure phenol; parachlorophenol; alpha and beta-naphthols, their sulphonic derivatives and salts; mono and dinitrophenols, trinitrophenol, trinitroxylol; orthonitroanisol, anisol; sulphonic dinitrophenol, picramic acid and their salts, pure para and meta cresols and their nitrogen and sulphonic derivatives, phenetol, chloronitrophenol; resorcine; ortho and para nitrophenol and their nitrogen, halogen and sulphonic substitution derivatives; diamidiophenol, orthonitrochloramidephenol and their sulphonic derivatives; dioxynaphthalines and amidonaphthols, their salts and sulphonic derivatives; halogen, nitrogen, acetyl, phenyl and alkyl derivatives of the dioxynaphthalenes and amidonaphthols and their sulphonic derivatives; meta-amidophenol, meta amidoparacresol and their alkyl derivatives; hydroquinine; sulphate and hydrochlorate of monomethyl-paraamidophenol; acetylparaamidophenol; pyrocatechol; salicylic acid, ortho and meta cresotic acids; nitro and amido salicylic acids; phthalic acid and anhydride; nitrogen and amido derivatives of benzoic acid; dioxybenzoic acids, naphthol-benzoic acids and thiosalicylic acids; salicylates of ethyl and methyl; acetylsalicylic acid; acetanilide; aniline, its salts and sulphonic derivatives; crude toluidine, orthotoluidine, its salts and sulphonic derivatives; beta naphthylamine and its salts; para toluidine and its sulphonic derivatives, mono and dimethyl-anilines, paranitraniline, xylidines, cumidine, diphenylamine, ditolylamine; mono and di-ethylanilines, ethyl and methylorthotoluidines, benzyl-aniline, benzylorthotoluidines, chlorine derivatives of aniline and their sulphonic derivatives, chlorine and sulphonic derivatives of paranitraniline; diethylmetasulphanilic acid, hydroxylic, amido and amidohydroxylic derivatives of diphenylamine, and of ditolylamine, as well as their nitrogen and sulphonic derivatives; chlorine benzidines; paraphenetidine; phenacetin; benzaldehyde; halogen, nitrogen, amido hydroxylic, and sulphonic derivatives of benzaldehyde and of methyl and dimethylbenzaldehyde.

Netherlands.—Solid fats, manufactured from non-perfumed oils by a chemical addition of hydrogen and bromoform, may be imported free of duty. Diphenylemethane is subject to a 5 per cent. *ad valorem* duty and betanaphtholethyl ether to a duty of fl. 4.25 per kilog.

Norway.—The export prohibition on salt has been withdrawn.

Poland.—The following may be imported with import permits: Chloride of potassium, sulphate of potassium; Stassfurth salts, ground or not; sulphur, raw or refined; antimony; borax, crude, not purified (borax tincal); minerals containing boron, perborates, hyperboric acid; magnesite, calcined or ground; talc, native, calcined or ground; citrate of lime; tartrate of lime; cream of tartar; sulphate of baryta, chemically precipitated; witherite, ground or not; strontianite (carbonate of strontium), celestine (sulphate of strontium); salammoniac; carbonate of ammonia; nitrate of ammonia; liquid ammonia; sulphate of ammonia; arsenic, metallic; white, yellow and red arsenic; chrome alum; chromates and bichromates of potash and soda; gas purifying material (Lamings', Lux's, &c.); ferro-cyanides, yellow and red; alum in crystals; calcined, pulverised, &c., alum; sulphate of alumina; peroxide of barium; oxides (hydrous and anhydrous) of barium, strontium and aluminium; nitrate of potash, nitrate of calcium and cyanamide. Chloride of magnesium and of lime (not purified); sulphate of magnesia; carbonate of calcium precipitate; bicarbonates of potash and soda; peroxides and persulphates of potash and soda; hydrosulphate of soda; potash; sulphide of soda; sulphites of soda and potash; ammoniacal soda, crystallised; caustic soda, metallic soda; acetates of calcium, soda and lead; chlorate of potassium (Bertholet's salts) and of soda; hypochlorite of soda; chloride of lime purified (bleaching powder); sulphuric acid, including anhydrous sulphuric acid; nitric, hydrochloric, acetic, formic, tartaric, citric, tannic, gallic, pyrogallic, salicylic, benzoic, phosphoric, and chromic acids; sulphide of carbon; iron vitriol, copper vitriol and zinc vitriol; nitrate of silver; salts and compounds, containing gold, silver and platinum, only for photographic purposes; compounds of antimony; emetic (tartrate of potash and antimony), fluoride of antimony, lactate of antimony and oxalate of antimony (artificial); basic nitrate of bismuth; nitrite of soda; benzol refined; benzidine and its salts; bromine and bromide of iron; chloride of iron and barium, cyanides of potassium, sodium and barium; cinnabar; dimethyl-aniline, diethylaniline and their nitrates; iodine, iodides of potassium and sodium; tin stone; oxalic and lactic acids, tartar; colourless carbolic acid in crystals and liquid; orthoamidosulpho-benzoic acid for the manufacture of saccharine (Permit of Monopoly required); sulphonic acids; oxalic acid, compressed gases; resinous soap of a lead basis and other resinous acid salts; naphthols; naphthylamine and its salts; nitro benzol and nitronaphthaline and their salts; paranitraniline and its salts; chemical compounds for use in protecting shrubs and fruit trees against infection, as well as for the elimination of noxious plagues in agriculture; sublimate; oxide of nickel, sulphide of nickel, oxide of tin, oxide of bismuth; toluidine and its salts; acetone; iron powder; aniline and its salts; vegetable oils (olive, also deteriorated, bay, cotton, alizarine, Turkish varnish, castor, sunflower, coconut, palm, hemp, flax, and rape oil, glycerine, cocoa, butter); colours of artificially prepared oxide of iron; natural colouring earths of all kinds (earths of Cassel, Sienna and Verona), Armenia bole mummy, washed, calcined or ground; quercitron, dye woods, in pieces or chopped up; litmus (turnbula) blue, ultramarine—not in small packets, Prussian blue and Parisian blue; white lead; Argentiferous litharge; lead ashes; lead minium; copper colours (verdigris) and copper arseniate; dyeing compounds and extracts; carmine, safflower (carthamine), orehil, indigo carmine, hemateine; synthetic colouring substances, pigments, varnish pigments, &c.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Notice of Intended Dividend

BINNS, F., & BINNS, M., 30, Queen Street, Haworth, carrying on business in co-partnership as Binns Brothers, at Mantra Mills, South Street, Keighley, Yorkshire, soap manufacturers. February 5, W. Durrance, Official Receiver's Offices, 12, Duke Street, Bradford.

Notice of Dividend

COOMBES, R. W., "The Nest," 94, Christchurch Road, Bournemouth, and FULLER, W. A., "Eversley," Durley Road, Bournemouth, formerly carrying on business in co-partnership under the style of R. W. Coombes and W. A. Fuller, Ormsary, 22, Christchurch Road, Bournemouth, glass merchants. 8s. 6½d. first and final. January 29, Official Receiver's Office, Midland Bank Chambers. High Street, Southampton.

Companies Winding Up Voluntarily

ACME METAL WORKS, LTD. (in voluntary liquidation). A general meeting of members will be held at 65, London Wall, London, on Friday, February 25, at 12.30 p.m.

ATLANTIC PATENT FUEL CO., LTD. (in voluntary liquidation). A meeting of creditors will be held at the offices of Hare & Harting, Chartered Accountants, 31-34, Basinghall Street, London, E.C., on Saturday, February 5, at 11 a.m. Creditors' claims on or before February 4 to the Liquidator, A. C. R. Hare.

EAST CORNWALL CHINA CLAY CO., LTD. E. J. Hancock, Masonic Buildings, St. Austell, Liquidator.

METAL INDUSTRIES, LTD. (in voluntary liquidation). A meeting of creditors will be held in the Company's premises, Thames Street, Sunbury-on-Thames, on February 4, at 11 a.m. H. Hornyold, Liquidator.

Liquidators' Notice

VAUXHALL GLASS WORKS, LTD. A general meeting of members will be held at 11, Ironmonger Lane, London, E.C. 2, on February 28, at 12.15 p.m. H. M. Cordrey, Liquidator.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

UNITED GLASS BOTTLE MANUFACTURERS, LTD., London, W.C.—Reg. January 14. Charge securing all moneys due or to become due, to Lloyd's Bank, Ltd, charged on shares in various companies, also general charge £197,556. April 14, 1920.

Satisfactions

BLEACHERS' ASSOCIATION, LTD., Manchester.—Satisfactions reg. January 14, £35,000, part of amount reg. April 20, 1910; £10,000, part of amount reg. January 11, 1912; and £4,000, part of amount reg. December 2, 1912; also reg. January 17, £30,000, part of amount reg. April 6, 1918.

RADNORSHIRE COAL, LIME & GENERAL SUPPLY CO., LTD., Knighton.—Satisfaction reg. January 17, £2,500, reg. July 18, 1904, and November 9, 1905.

RAGUSA ASPHALTE CO., LTD., London, E.—Satisfactions reg. Jan. 12, £3,000, reg. October 4, 1918; and £4,000, reg. December 29, 1919.

County Court Judgment

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

HUTCHEONS, J., 139, Golden Hillock Road, Small Heath' Birmingham, chemist, £14 13s. 1d. December 7, 1920.

Bankruptcy Proceedings

As briefly announced in THE CHEMICAL AGE last week, the public examination of Felice Adolfo Bonaventura, Hugh Edward Aveline, and Edwin Harrison, trading as Felix Bonaventura & Co., chemical merchants and importers, 24, Great Tower Street, E.C., was held at the London Bankruptcy Court on January 19. A joint statement of their affairs showed gross liabilities £17,624 2s. 6d., expected to rank for £14,743 17s. 6d., and net assets valued at £148 10s. 9d.

Examined by the Official Receiver, Bonaventura said he started a business as fruit importer and produce merchant in 1906 and was joined six years later by the debtor Aveline. Early in 1913 they extended the scope of their business, dealing in essential oils, gelatine, saccharine, grease and fats, &c. In February 1913 they engaged Mr. Harrison, a qualified chemist and commenced dealing in chemicals and drugs. They did practically no business in either chemicals or drugs after the outbreak of war because most of their goods came from Germany. In 1916 they acquired the formula for making pure lanoline and took works at 39, Marshgate, Stratford, and carried on business there as the Hab Chemical Co. The lanoline business was not a success and was closed at the end in 1918. The debtors attributed their failure to loss in trading, the general slump, and depreciation in the value of their stock.

Mr. Harrison said that he had not regarded himself as a partner and he had refused to sign a draft agreement. He agreed, however, that his name appeared on the firm's letter paper, and also on the return under the Registration of Business Names Act.

Canada's Pulp Industry

ALTHOUGH the closing months of 1920 were characterised by a sensational drop in the shares of all paper companies in Canada, the industry has made phenomenal progress, and the readjustment of market values does not reflect any fundamental weakness. Heavy demands for pulp and paper have been experienced from the United States, recent statistics showing that the Dominion supplies a large proportion of American needs. In 1890, according to Mr. C. P. Green, of the Canadian National Railways, the pulp and paper industry only exported to the extent of $120; to-day there are $26,000,000 invested in pulp and paper, 1920 production approximated over $160,000,000, while exports were in the neighbourhood of $150,000,000, the United States receiving about 80 per cent. of the latter. The exports for the half-year ended September of $87,000,000 were double those of 1919. Mr. Green pointed out in a recent address that Canadian production is now more than double that of Sweden, Norway and Finland combined.

The pulp forests of Canada are all more or less tributary to the lines of the Canadian National Railways, and it is estimated that in Ontario and Quebec alone there are 450,000,000 cords, not counting the wooded areas, in the North at present more or less inaccessible. These forests will supply the present output of Canada for seventy years; in British Columbia there is sufficient wood to last at least sixty-five years, or a total of 135 years. Putting the length of time it takes to grow a spruce tree to commercial size at 100 years, if a sane policy of cutting and forest preservation is followed, Canada will be able to carry on in perpetuity.

During the visit of Lord Burnham to Canada with the Press Conference he was much impressed with the Quebec Mills at Chicoutimi and Lake St. John. He is reported to have said that it was to Canada Great Britain would have to look for an increased supply of pulp and paper. Labour is plentiful and skilled in all industries arising out of the manufacture of wood into anything from a ship to wood pulp, and its products.